The Only Journal With a Paid Circulation in the Rock Products Industry

Rock Products

Vol. XXIV, No. 14 CHICAGO July 2, 1921

EDITORIAL DEPARTMENT—

Nathan C. Rockwood, Editor
Chas. A. Breskin, L. R. Croy } Assistant Editors

ADVERTISING STAFF—

Charles H. Fuller, Eastern Manager, 101 West 41st Street, New York City

A. S. Barnett
Western Representative

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ROCK PRODUCTS—

Geo. P. Miller, Manager
E. M. Gibson, Assistant Manager

Published every other Saturday by

TRADEPRESS PUBLISHING CORP.
542 South Dearborn Street, Chicago, Ill.

W. D. Callender, President.
N. C. Rockwood, Vice-President.
Geo. P. Miller, Treasurer.
C. O. Nelson, Secretary.

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Schaffer Lime Plants can be built in small units embodying all the essential economical features of our large plants. Owing to freight conditions and the necessity for localizing certain operations, the

Schaffer Engineering & Equipment Co.

are in a position to offer a real service in connection with the design and installation of lime plants of either large or small capacity. The matter of economy in operation, whether in large or small units, will be paramount for the next several years. Also the necessity of quality as evidenced by Schaffer Engineering and Equipment Company plants is equally important.

Schaffer Engineering & Equipment Co.

Peoples Bank Building **PITTSBURGH, PA.**

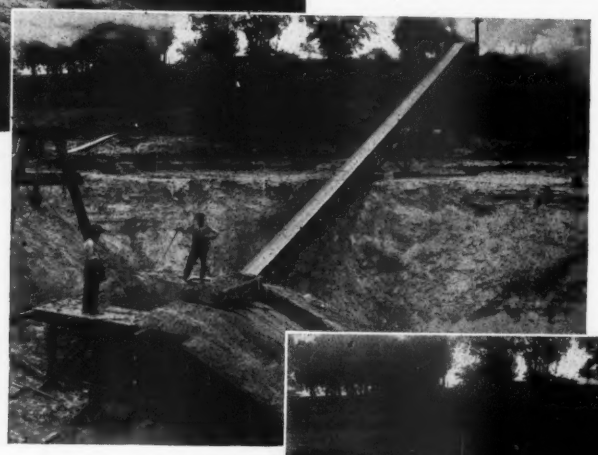
Conveyor Gets Out Silica Sand

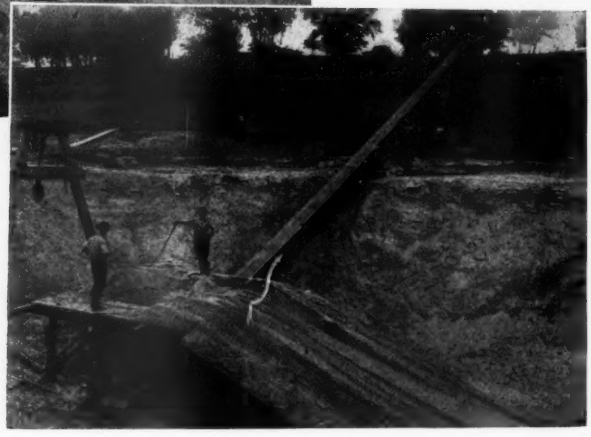
With the equipment shown, four men load a fifty-ton car with silica sand in forty minutes at the pit of the South Ottawa Silica Sand Co., Ottawa, Ill. One man fires the boiler and operates the cable winches. Another tops off the car and pinches it along the track. The other two keep the material flowing to the belt, breaking up occasional soft lumps that appear.

A steam engine operates a four-ton dragline which feeds a B-G Standardized Conveyor 96′ long with 24″ belt. The conveyor is driven by a kerosene tractor. The hopper was constructed at the pit by the owners, Cebulske brothers.

Mounted on skids, the B-G Conveyor can be moved along as the sand is taken out to the limit of the conveyor. When it is desired to reach a greater depth, additional standardized lengths in 3′ multiples can be added to the conveyor.

Properly adapted to your conditions, B-G Conveyors will eliminate all unnecessary laborers and thus save money as did the South Ottawa Silica Sand Co. B-G Engineers will analyze your problems without cost to you. They can show you how to adapt B-G Equipment to your plant to save operating expense. Ask for this service today.





Write for bulletin V which shows many applications of B-G Conveyors to sand and gravel handling problems.

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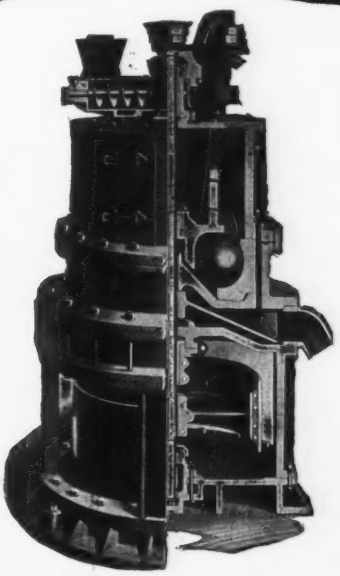

THE Fuller-Lehigh Pulverizer Mill is unequalled for producing Agricultural Limestone.

It will reduce lump rock to 20, 40, 60, 80, 100 or 120 mesh and requires no outside accessory equipment, no overhead shafts, drives or screens.

All the material discharged from the mill is finished product.

The feeding system is uniform, the discharge is constant and free and the operation is dustless.

Low installation cost. Low operating cost. Low lubricating cost.

It is built in sizes to meet the requirements of your trade, and will grind rock to meet the specifications of all agricultural experiment stations.

Let Us Send Catalog and Quote on Your Requirements

Fuller Products for Fullest Satisfaction

- Preliminary Mills
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- Ball and Tube Mill Liners and Partition Plates
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- Sprockets, Traction Wheels and Roll Heads
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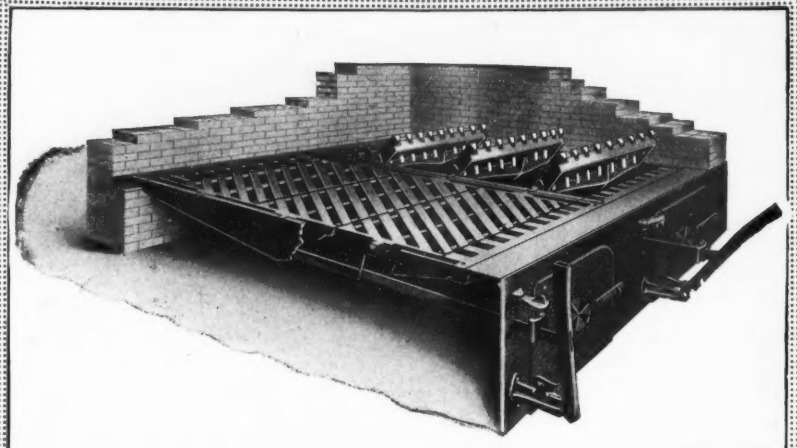

Proven Results—

Repeat orders come only from satisfied customers.

McGinty Grates have made good after severe tests at the Cold Springs plant of the National Mortar and Supply Co. of Pittsburgh, Pa. This is a model electrically operated plant with a hydrating capacity of 125 tons per 10-hour day.

One set of McGinty Grates were put in this plant about three years ago to test out in comparison with other make Shaking Grates they were using at that time and now the entire equipment is McGinty.

These grates are made of a material of which the melting point is from 400 degrees to 600 degrees higher than grey iron—therefore will withstand a higher degree of heat without warping than any other grate now on the market.

It is a shaking and dumping grate scientifically designed to meet the high duty and capital requirements of kiln and hydrating practice.

It is so constructed that there is more air area, therefore will burn a lower grade of coal than is possible on old style bars.

You don't take a chance—you must be convinced of its economy and the fact that it will meet your most exacting requirements.

You can clean fires with the doors closed.

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LIME
PROPERLY BURNT

Uniformity of product is vital in holding the trade in a highly competitive market.

Vertical Kilns have long been known to produce the best burnt lime.

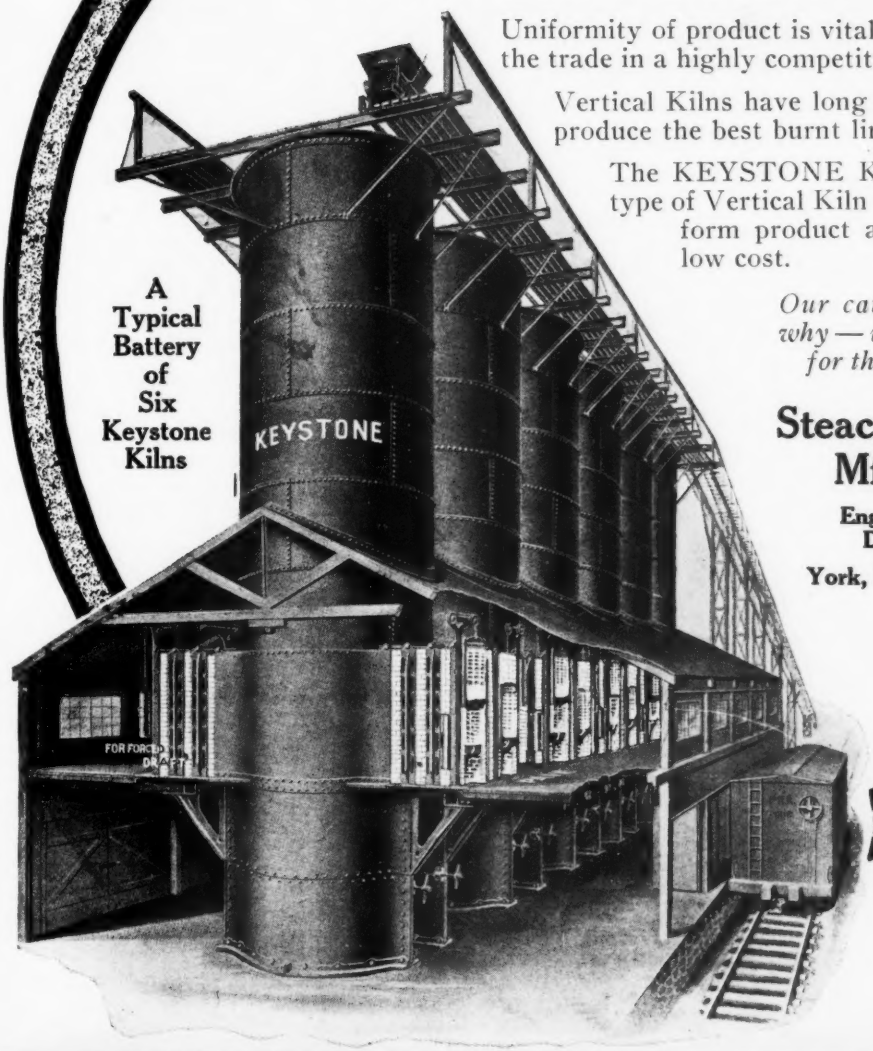
The KEYSTONE KILN is the one type of Vertical Kiln producing a uniform product at a surprisingly low cost.

Our catalog tells why — it is yours for the asking

Steacy-Schmidt Mfg. Co.

Engineers and Designers

York, Pennsylvania

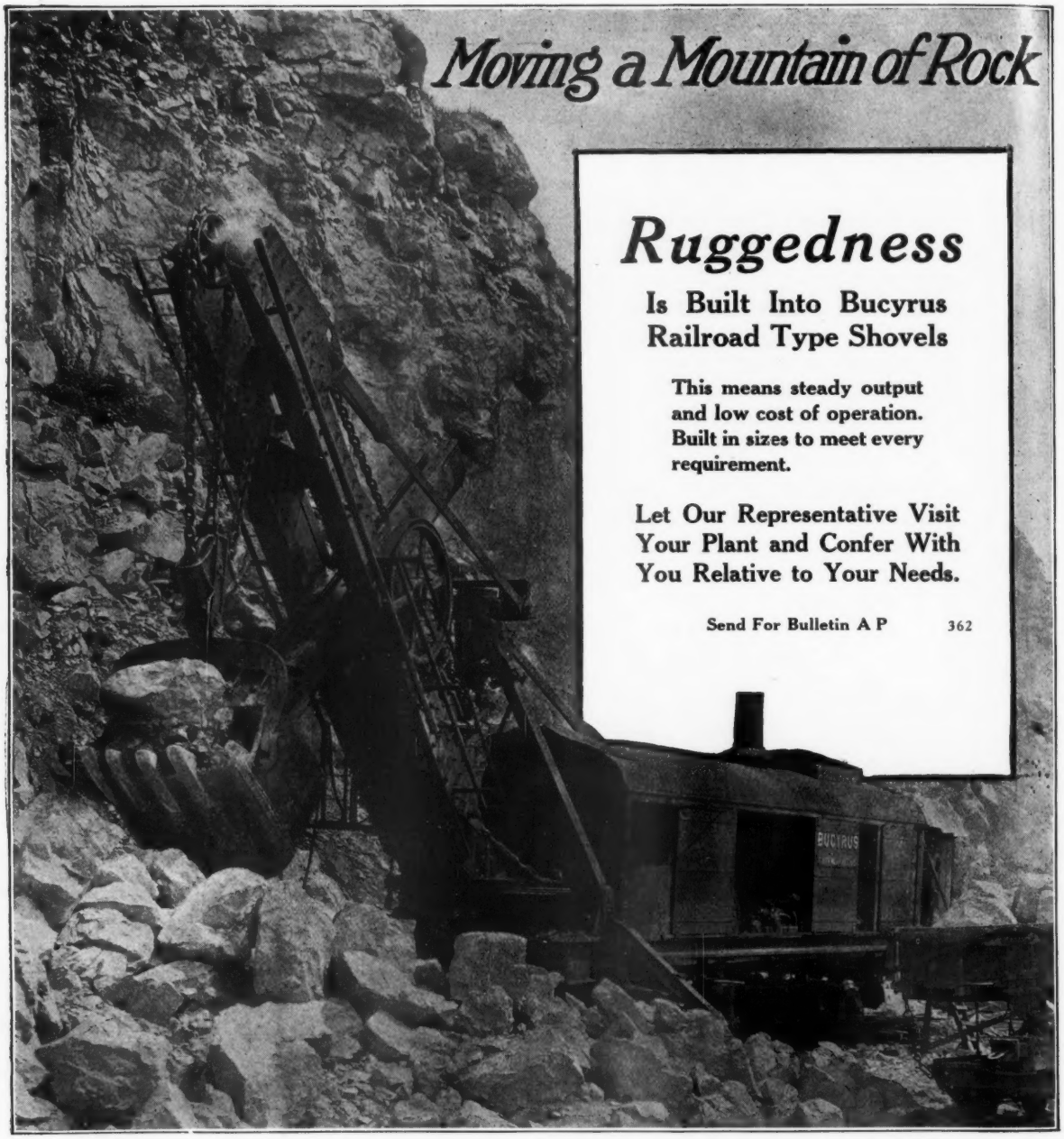


A Typical Battery of Six Keystone Kilns

Coal Fired
Wood Fired
Oil Fired
Producer-Gas Fired
Natural-Gas Fired

KEYSTONE STANDARDIZED LIME KILNS

BUCYRUS



Ruggedness

Is Built Into Bucyrus Railroad Type Shovels

This means steady output and low cost of operation. Built in sizes to meet every requirement.

Let Our Representative Visit Your Plant and Confer With You Relative to Your Needs.

Send For Bulletin A P 362

Bucyrus Company, South Milwaukee, Wisconsin

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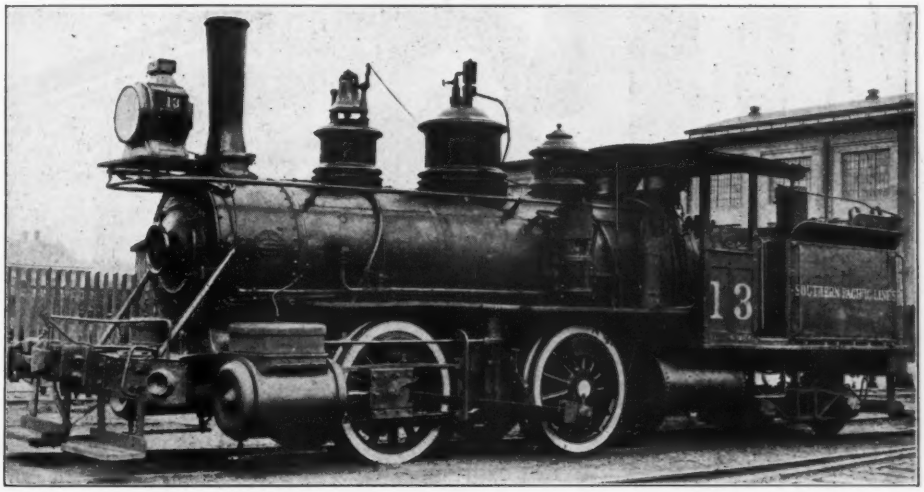
Built in 1879; praised for its good work in 1880, and still in excellent condition after forty-two years of continuous operation



Baldwin Locomotives Are Built to Give Service

The following letter was published in a Baldwin Catalog in 1881:

MORGAN'S LOUISIANA AND TEXAS RAILROAD AND STEAMSHIP COMPANY

New Orleans, August 11, 1880.

Messrs. Burnham, Parry, Williams & Co.,
Baldwin Locomotive Works, Philadelphia, Pa.

Gentlemen: In reply to yours of 6th instant, the two locomotives you furnished for our ferry approaches work admirably, being able to start or stop with a train anywhere on the incline, which is 1' in 15'. At this time the water is high, making the incline shorter than when the water is low. There is now about 150' of incline holding, say, 5 cars, the weight of each car being, say, 9 tons, and carrying from 10 to 14 tons of lading, the total weight of cars and lading on the incline being from 95 to 115 tons. At extreme low water the length of the incline will be about 300', or, say, 9 cars and the locomotive. The engines now do their work so easily that I am satisfied that they will answer all purposes they were intended for.

Very truly yours,
(Signed) NEWELL TILTON,
Assistant Sup't and C. E.

One of the locomotives referred to in this letter is still at work, doing miscellaneous switching at the Algiers, La., shops of the Southern Pacific Co., and is in first class condition. Its present appearance is shown in the illustration.

THE BALDWIN LOCOMOTIVE WORKS

PHILADELPHIA

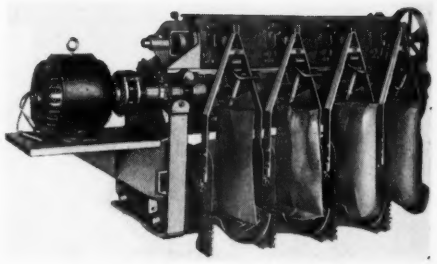
LOCOMOTIVES

The Most Economical

BATES VALVE BAGS AND SACKERS

HERE is something you actually need. A system of packing loose materials in the most efficient and most economical manner yet developed.

Bates Valve Bags require neither hand or machine sewing. They seal themselves automatically. They are made with the greatest care of the best and toughest paper stock obtainable.



Buy Your Valve Bags of All Kinds From Us

Address All Communications t

The Valve Bag Co

Oakmont, Pa.

TOLEDO, OHIO

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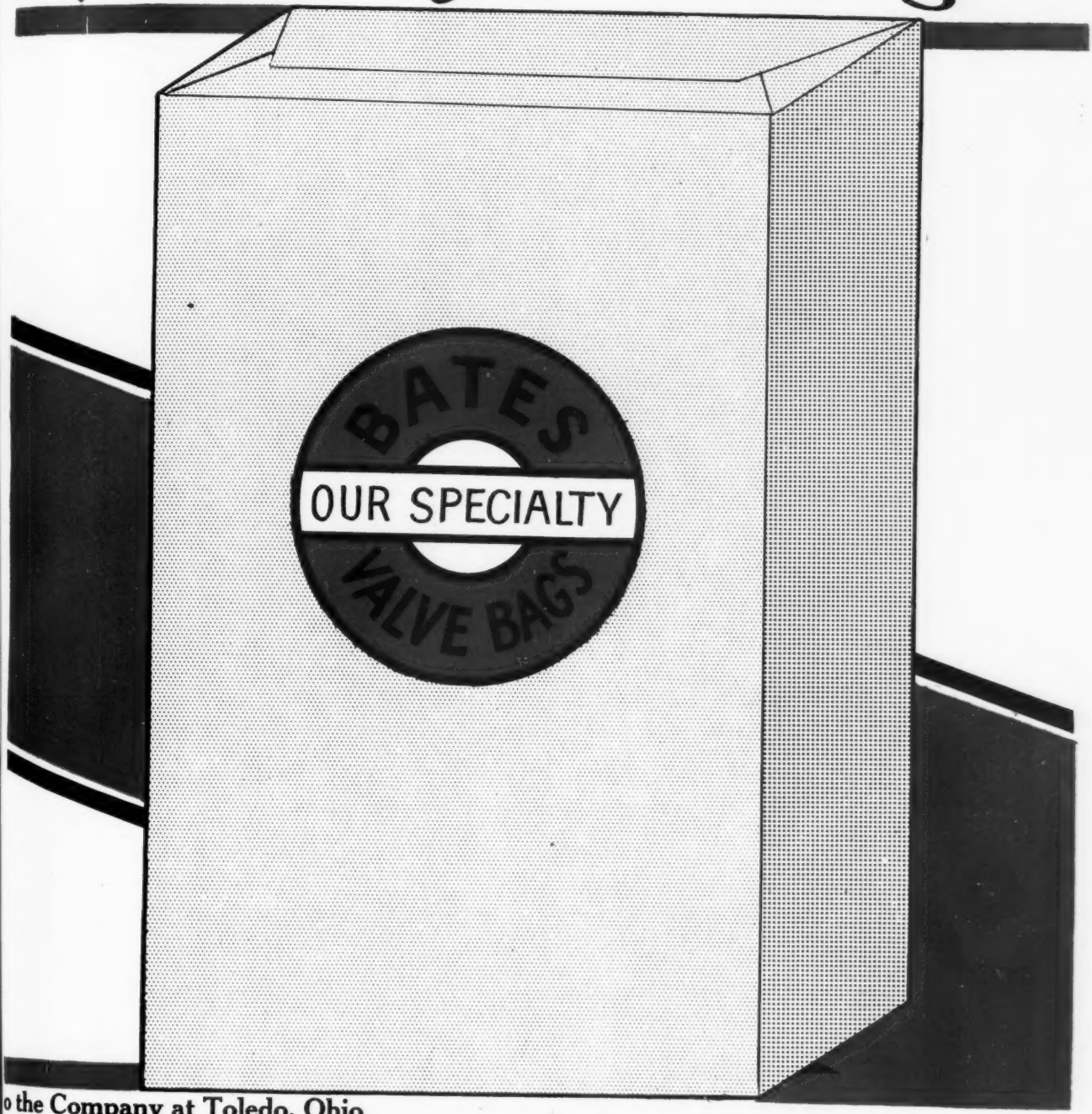

o the Company at Toledo, Ohio

mpany of America

OHIO

Windsor, Ontario, Can.

A Large Quarry Where Hercules Explosives Are Used

Hercules Blasting Supplies

are of the same high quality as Hercules Explosives. They include every accessory necessary for effective blasting.

Blasting Machines
Rheostats
Blasting Caps
Electric Blasting Caps
Waterproof Electric Blasting Caps
Cordeau-Bickford Detonating Fuse
Safety Fuse
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Delay Electric Igniters
Connecting and Lead Wire
Thawing Kettles
Dirt Augers
Galvanometers
Cap Crimpers
Tamping Bags
Subsoil Bars

Hercules Special No. 1 For Quarry Blasting

Hercules Special No. 1 is one of the most effective and economical explosives that can be used in many quarries. It is "bulkier" than ordinary dynamite and, therefore, contains a greater number of cartridges for any given weight. It will average about 270 sticks (1¼" x 8") per hundred pounds, compared to an average of 200 for 40% Extra (Ammonia) Dynamite. For this reason, it costs approximately 25% less *per cartridge* than 40% Extra Dynamite and frequently will replace 40% Dynamite in quarry work without increasing the number of cartridges used per charge. Furthermore, it is suited for use in cold as well as warm weather. It will pay you to try Special No. 1 in your quarry both for large shots and secondary blasting.

The Hercules Powder Co. is always ready to assist you in reducing your blasting costs to a minimum and maintains a Service Division for this purpose.

The nation-wide distribution of Hercules plants, storage magazines and sales offices assures prompt delivery on your orders for Hercules Explosives and Blasting Supplies.

Communicate with our nearest office.

HERCULES POWDER CO.

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WEBSTER MACHINERY

For Elevating and Conveying in Quarries, and in Sand & Gravel Pits

Your conveying problem may present conditions—unusual features—which seem to be impossible to overcome, yet these problems can be quickly solved by Webster Engineers, who not only have access to engineering records covering nearly a half century of uninterrupted achievement, but represent a development in material handling far in advance of many present-day conveying problems.

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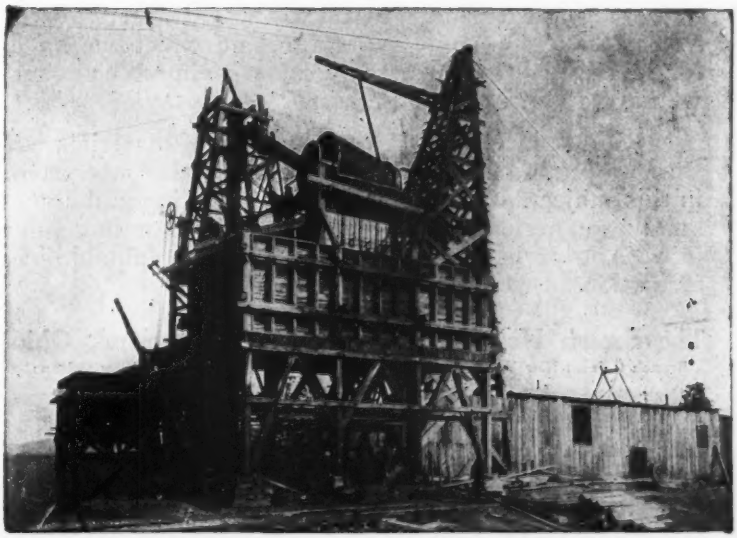
4500-4560 CORTLAND ST., CHICAGO
Factories-Tiffin, O. Michigan City, IND. *and* Chicago-Sales Offices *in* Principal Cities



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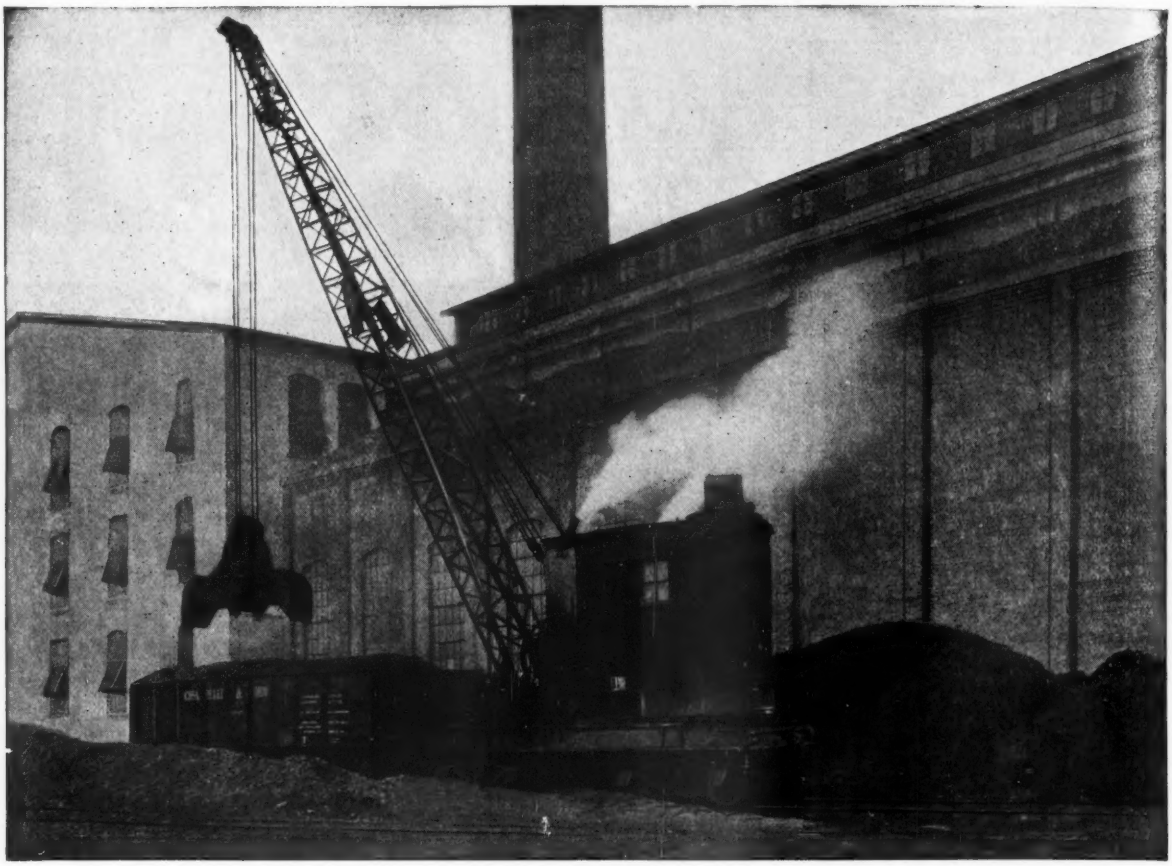

"In every respect our best labor-saving device"

Writing us recently the president of the Kalamazoo Vegetable Parchment Co. said, "We appreciate very much the receipt of your catalog, as it gives us a good many ideas which we will undoubtedly incorporate into our new mill.

"We are mighty glad to know that you make other things besides locomotive cranes, one of which we purchased from you some years ago, and which we have found in every respect the best labor saving device that we have about our entire plant."

If you are interested in the handling of materials we want to remind you that Brownhoist is also interested in this subject. Over 40 years of engineering and crane building experience can be yours on any handling subject. And perhaps we can give you some valuable information as we did the above company.

The Brown Hoisting Machinery Co., Cleveland, Ohio

Branch Offices: New York, Pittsburgh, Chicago, San Francisco and New Orleans

BROWNHOIST

DEDICATED TO QUALITY SINCE 1880

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GO UP IN THE AIR

AUTOMATIC AERIAL TRAMWAY

This modern method of transit is an air LINE to success

We Want to Show You Lower Production Costs

We desire to solve your haulage proposition

We can demonstrate that you will receive the maximum of service for each dollar spent.

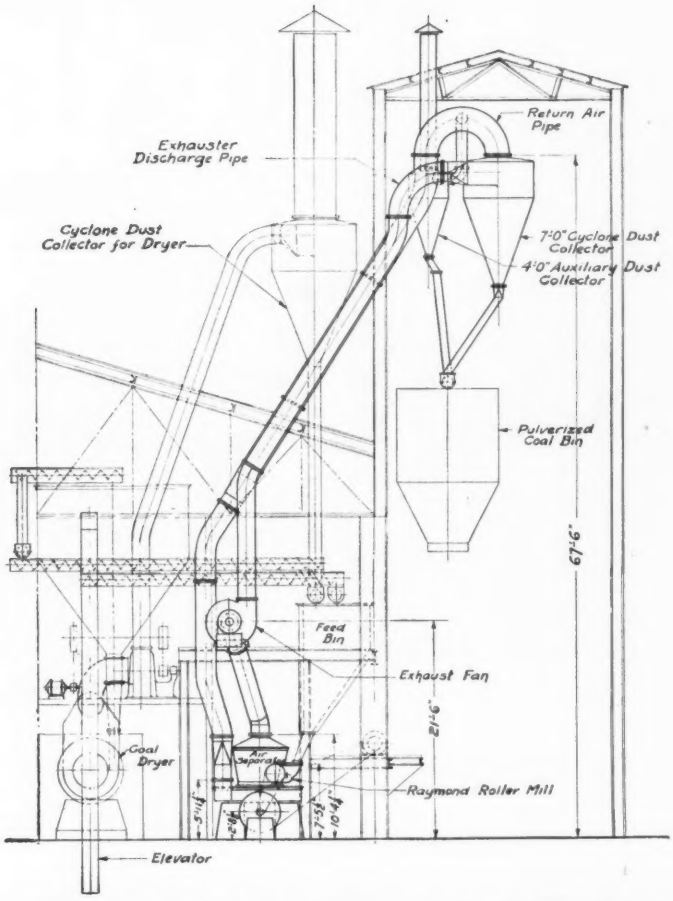
Low Initial Cost--Low Operating Charges
Low Maintenance Expense

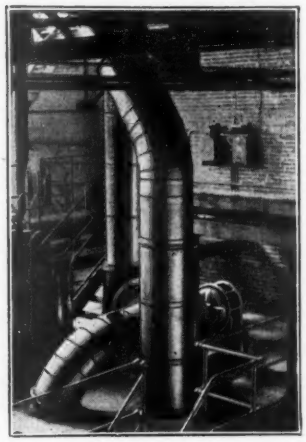
Our engineers will work out a plan
if you will furnish particulars.
Send for our Questionnaire

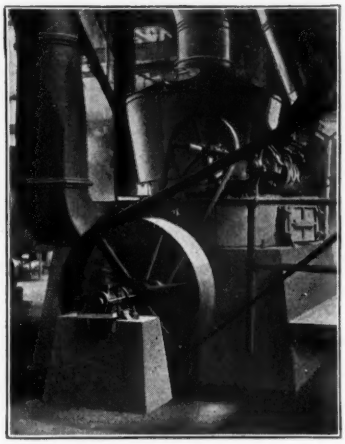
Write us for photographs and description

Interstate Equipment Corporation

25 Church Street **New York City**







RAYMOND ROLLER MILLS

THE ECONOMICAL GRINDING UNIT FOR MAKING POWDERED FUEL

In this large boiler plant of a nationally known concern two 6-Roller Raymond Mills have contributed largely to the successful burning of powdered coal.

These mills are each delivering 5.9 tons of Illinois coal per hour ground to a fineness of 95% passing a 100-mesh test sieve; and the uniformity of the powdered coal made by Air-Separation, which eliminates all large particles, has made it possible for this plant to show remarkable economies in its use under boilers.

Raymond Roller Mills contribute to Powdered Coal Plants: Uniformity of finished product, easier handling of the powder, and dustless and economical operation.

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New York City

Raymond Bros. Impact Pulverizer Co.
1301 North Branch Street Chicago, Ill.

Western Office
201 Boston Building
Denver, Colo.

Above illustration shows a P. & H. 205 at work. The "206" machine has full corduroy traction

Steady Performance—Lower Costs

Steady performance, load after load, day after day, gives you the full return on your investment in P & H Material Handling Excavator-Cranes. The design and construction of P & H Cranes insure this service.

For loading and unloading of crushed rock, gravel, sand, coal, or other loose material P & H Cranes with clam-shell buckets are used in every part of the country.

Besides this, a drag line bucket, orange peel bucket, scraper bucket, electro magnet, or slip chains may be used.

If there is pile driving to do—the P & H can be rigged up to do this with but little trouble.

New Shovel Attachment Doubles Usefulness

The new Shovel Attachment developed by P & H engineers can be substituted for the standard boom on your No. 205 or 206 Excavator-Crane so that a power shovel is obtained the equal of any steam shovel of the same weight.

For the price of the Attachment a complete Power Shovel is secured.

This is just another example of the many and varied applications of these general utility machines. Another reason why you can reduce operating costs and quickly save the amount invested in a P & H Excavator-Crane.

Bulletins will be sent promptly by any of the following agents or offices:

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Pawling & Harnischfeger Co.
Milwaukee, Wis., U. S. A.

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P. & H. OFFICES IN New York City, New Orleans, Los Angeles, San Francisco, Seattle, Portland.

P&H EXCAVATOR-CRANES

When writing advertisers please mention ROCK PRODUCTS

Another Grasselli branch office established

TO better serve the interests of quarry owners in the West Virginia, Kentucky and southern districts, we have established a new branch at Bluefield, W. Va. Once again, Grasselli service has been expanded to co-operate more closely with users of explosives. Through this new branch, quarry operators in this territory can have their explosive requirements promptly filled.

Immediate deliveries are assured from the ample stocks carried in our magazines at Pemberton and Iaeger, W. Va.—black powders, dynamites, safety fuse, caps, electric caps—and all the other Grasselli products.

We invite you to use Grasselli Service. Our representative, an experienced quarry man, will gladly call and talk this over with you. He'll prove to you, under conditions in your own quarry, that in "Grasselli" you have the most efficient and reliable explosives you've ever used.

The Grasselli Powder Company

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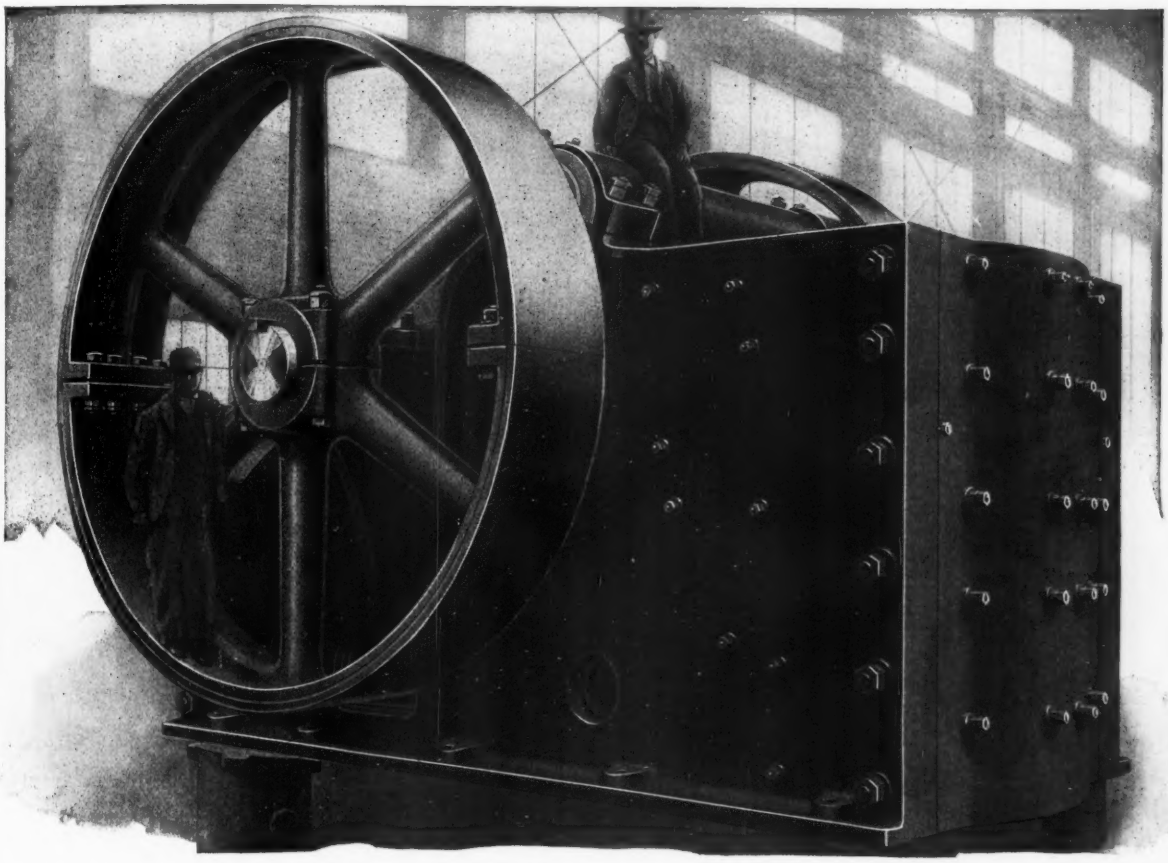

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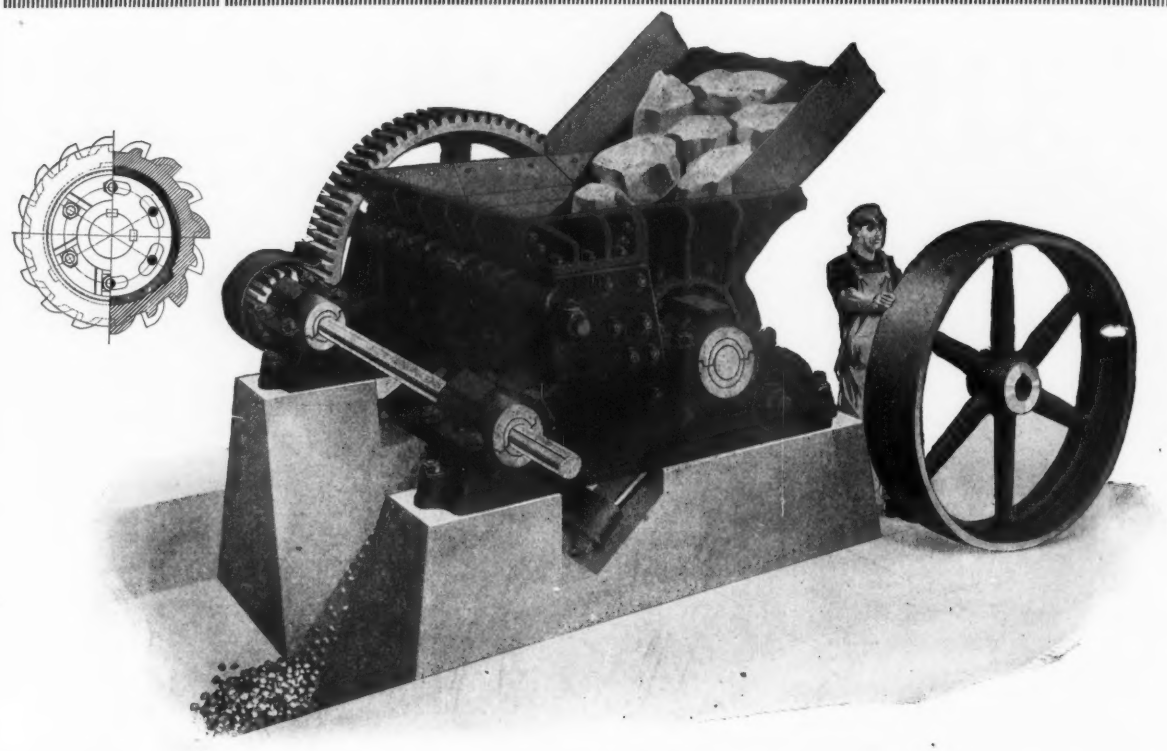

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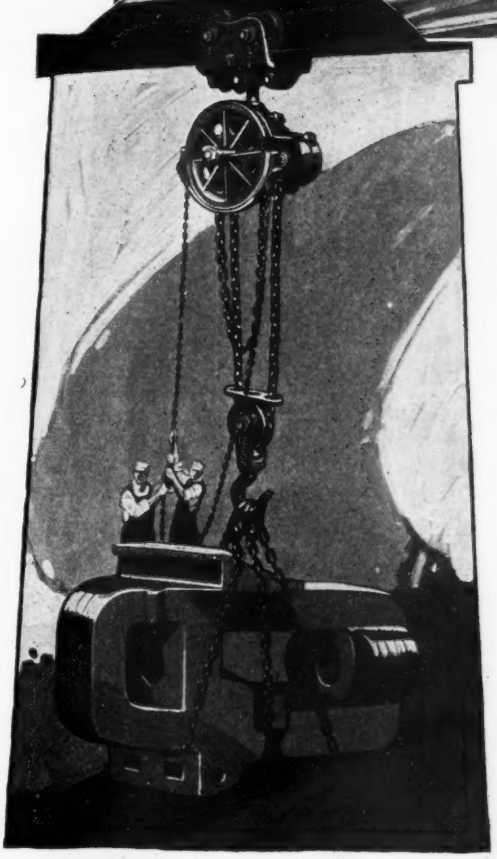

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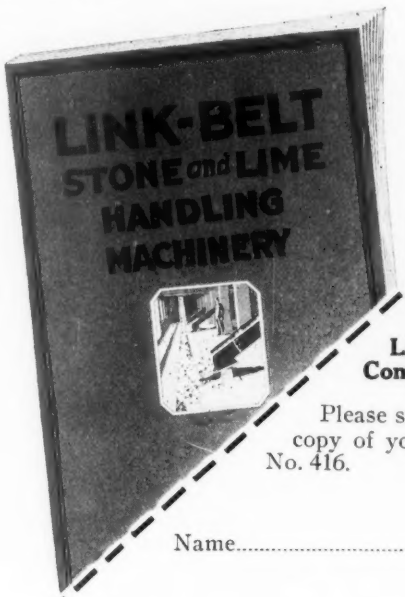

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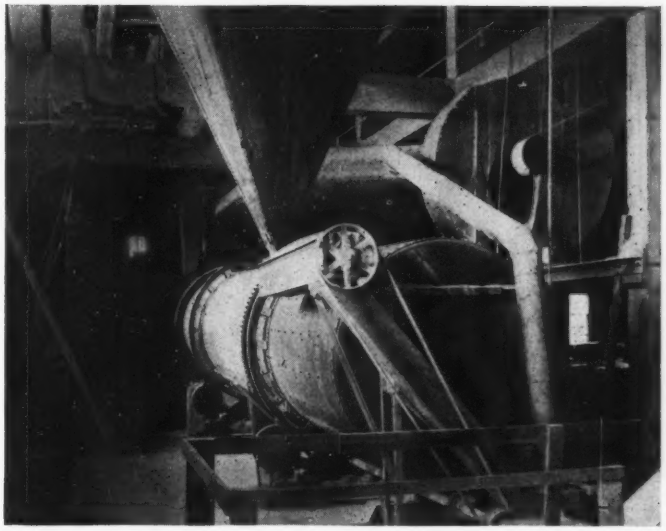

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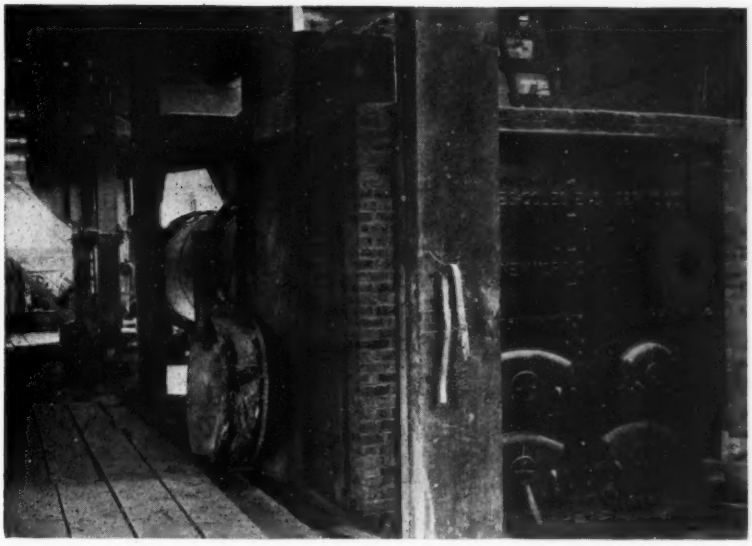

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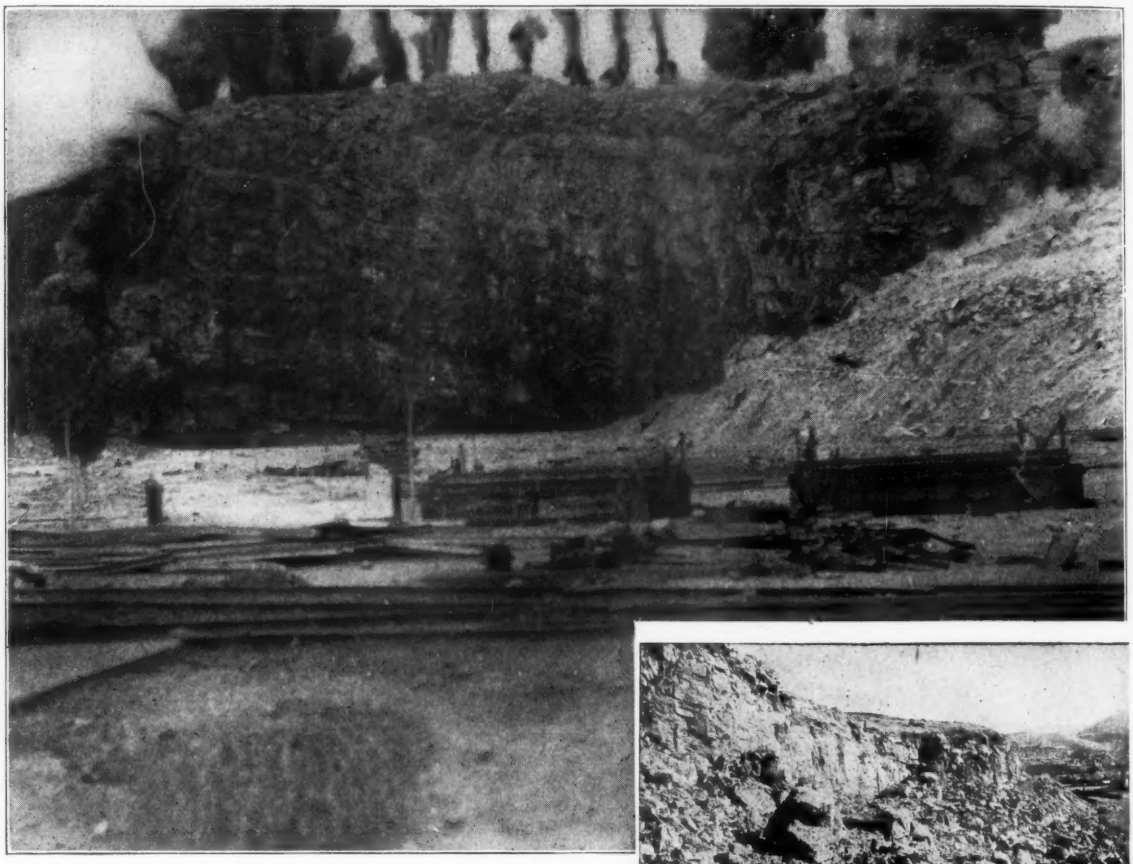

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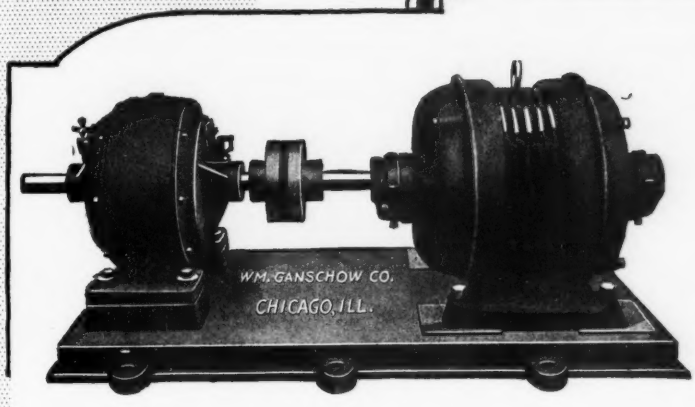

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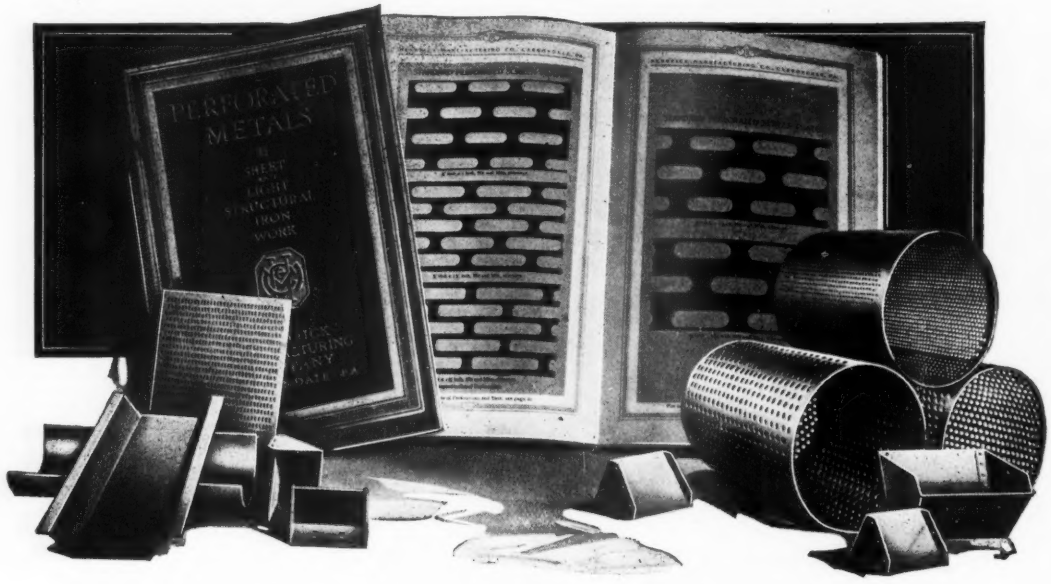

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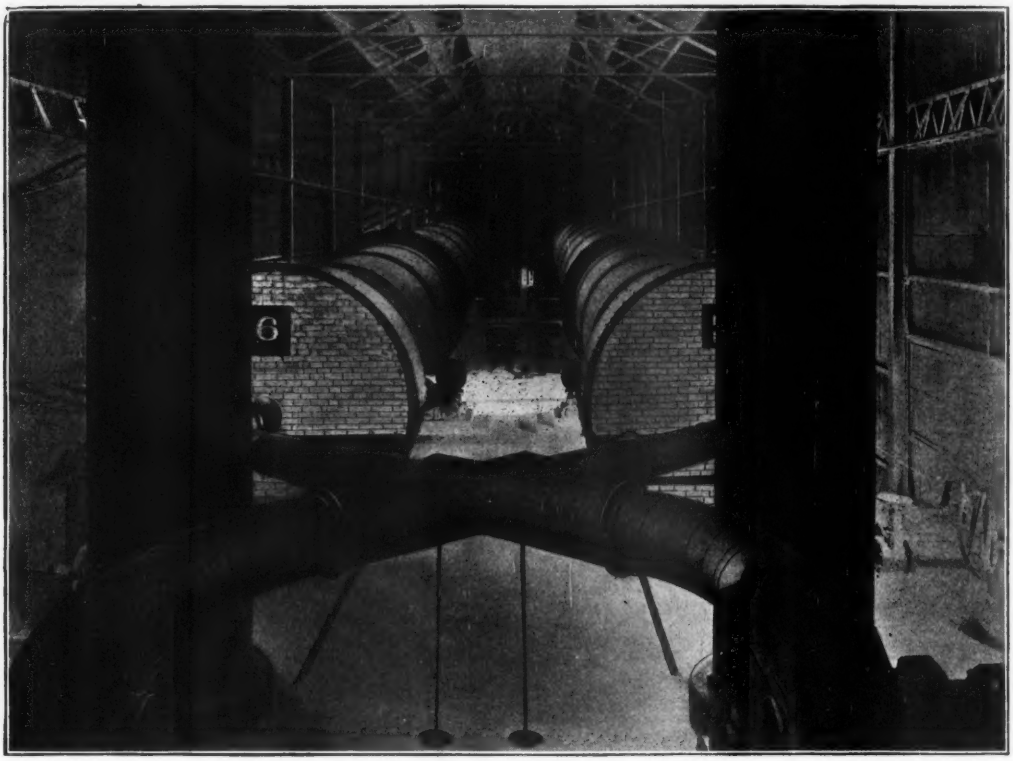

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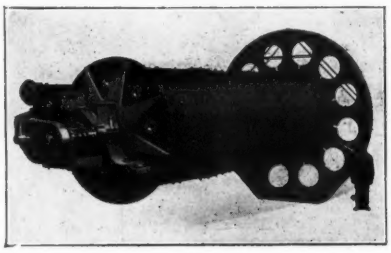

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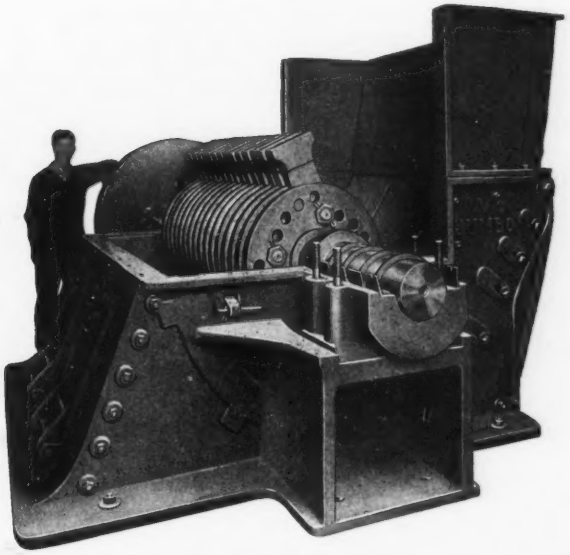

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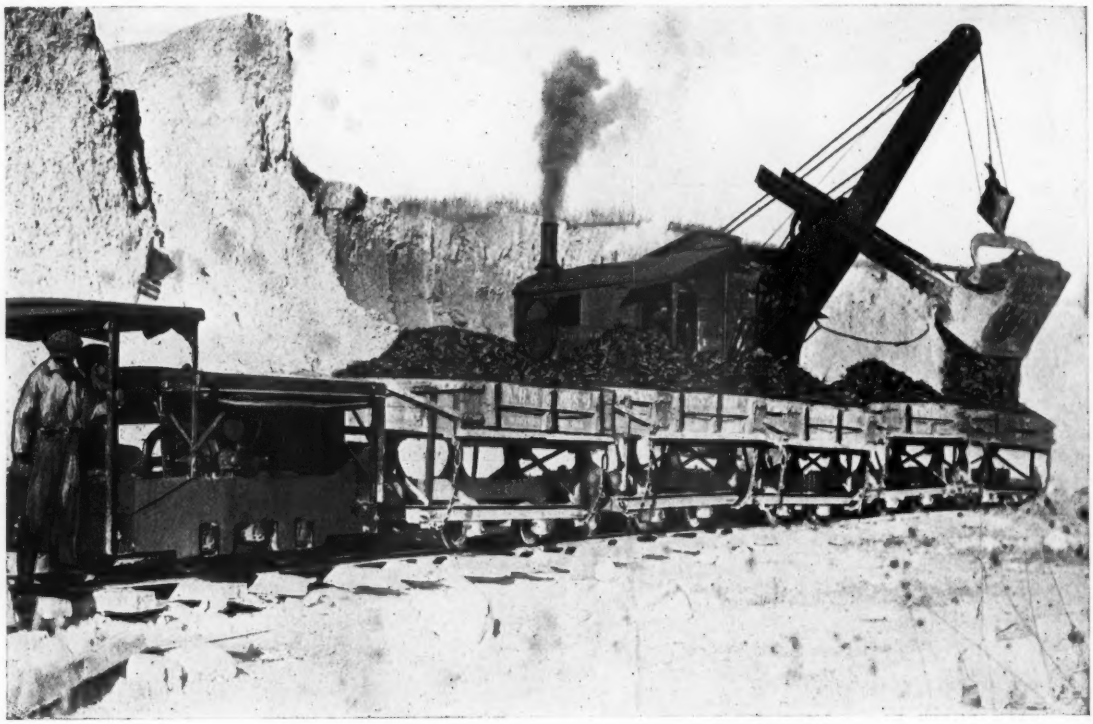

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Rock Products

Vol. XXIV | Chicago, July 2, 1921 | No. 14

Future of Lime Stucco

Lime Manufacturers Getting Ready to Cash in on a Good Reputation

LIME MANUFACTURERS, in convention assembled, at New York City, June 15, 16 and 17, got some inkling of the possibilities of lime stucco.

D. Knickerbacker Boyd, a prominent architect of Philadelphia, who is preparing a bulletin on lime stucco for the Structural Service Bureau, gave an interesting account of his investigation of stucco houses in and around Philadelphia.

Mr. Boyd said if lime were used *where* it ought to be used and *as* it ought to be used the annual tonnage consumed would be five times as great. He said lime, both straight lime mortar and lime-portland cement mortar, had been a successful stucco material in Philadelphia, and in Pennsylvania generally, since Colonial times.

As proof of the fact that a straight lime stucco is used on reputable buildings, L. H. Hart, manager of the construction department of the National Lime Association had taken the photograph below.

Possibly some readers will fail to recognize this handsome building, so let it be added that this is a view of the most highly sought-for residence in the United States, being no other than the executive mansion of the President at Washington.

Lime men feel that what is good enough for the White House ought to be good enough for Petey Dink.

East wing of the White House, Washington, D. C.—An example of lime stucco

JUL 10 '24

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Chemical Control of Lime Burning*

The Key to Kiln Efficiency

By W. D. Mount, M. E.
Consulting Engineer, Peoples National Bank Building, Lynchburg, Va.

EARLY IN 1919 I wrote a short article on certain principles in kiln operation, and their application in kiln construction.† The basis of my argument then as now, lies in a recognition of the fact that lime is produced as the result of a chemical reaction, and that while the process may be, and in many instances is, carried forward by rule of thumb methods in *complete disregard of the chemical and technical factors involved*, nevertheless, it is only through a very definite recognition of these factors and their bearing on the process that the road can be found to the attainment of the highest efficiencies and economies in operation.

In my former article the subject was treated more particularly from the standpoint of the specific factors of design necessary to complete chemical control of the process; now, however, I wish to approach the matter of chemical control in kiln operation from a little different angle, and to point out what it has done in the lime department of one of the most highly specialized industries in the world. I refer to the manufacture of sodium carbonate, or the soda ash of commerce, from common salt by the so-called Solvay, or more correctly, ammonia process, with which Industry I was for twenty-five years, until November, 1918, actively connected in a managerial capacity.

The operators of the above mentioned process are usually referred to as alkali manufacturers and their products as Solvay alkali. These comprise, in addition to the carbonate in its varying grades and densities, the hydrate or caustic, bicarbonate, sesqui carbonate, and a number of combinations of these products for special purposes, particularly of the carbonate and hydrate and the carbonate and bicarbonate.

Soda ash enters, in one form or another, directly or indirectly, into about all the products of industry.

It is a fact, although probably not generally known, that the alkali manufacturers are among the very largest, if not the largest, individual producers of lime in the country, though none of the lime produced is for commercial purposes, except indirectly as it enters into the manufacture of alkali in the several forms mentioned, together with numerous other soda products based on the carbonate as a raw material.

Ammonia Process of Alkali Manufacture

A brief description of the ammonia process for the manufacture of alkali and the function of lime in connection therewith may not be out of place at this time and of general interest to the members of the lime association.

The process hinges on the comparative insolubility of sodium bicarbonate in a cold solution of salt, or brine. The principal raw materials are salt (NaCl), limestone, and ammonia; the latter usually in the form of crude liquor from by-product coke ovens; large quantities of coal and coke are also required. The salt is usually, and in this country exclusively, in the form of a saturated brine pumped or forced from underlying beds of rock salt at depths varying from 300 ft. to 2000 ft. in different parts of the country.

The saturated brine enters the process directly as it comes from the wells, and without treatment for purification. After passing through certain washers for the purpose of scrubbing exit gases, carrying ammonia, it enters the absorbers, in which it is saturated with ammonia. This operation is accompanied by the evolution of heat. The ammonia delivered to the absorbers and a certain volume of CO_2 gas along with it react on the impurities in the brine, principally calcium, and magnesium salts, precipitating these impurities as a sediment, or mud, which is settled out as the brine passes through a series of tight vats, and finally through a cooler from whence it is pumped to the carbonators, where we have the first indirect contact with the raw material, limestone.

Limestone is burned in connection with the manufacture of soda for two purposes; as a source of CO_2 (carbon dioxide) gas for carbonating the ammoniated brine, and to furnish lime used in a secondary distillation process for recovering the ammonia. Disregarding the intermediate steps of the reaction, the essential and final result in the carbonators from treating the ammoniated brine with CO_2 gas is bicarbonate of soda and ammonium chloride. The last mentioned is in solution, and represents that portion of the raw material, salt, decomposed. The bicarbonate, precipitated, together with the ammonium chloride above referred to in solution, is drawn continuously from the carbonators, the bicarbonate separated by filtering, and the filtrate sent direct to the stills, where the ammonia is recovered by distillation with lime, according to the reaction:

Ammonium Chloride + Lime = Calcium Chloride + Ammonia.

The ammonia comes off as a gas, together with a considerable volume of CO_2, is cooled and piped direct to the absorbers, and the cycle is thus complete.

I might state here that all operations are continuous, running night and day, 365 days in the year, and under complete and constant chemical control.

Lime Kiln Operation

The lime kilns in an ammonia soda plant are usually quite high in proportion to the diameter, ranging from 60 to 70 ft., with an internal diameter from one-sixth to one-seventh of the height. They are operated under induced draft, and coke is used as a fuel, being charged direct with the stone—extreme care is taken in adjusting the ratio of the coke to the stone, and also in the sizing of each; a 6-in. cube represents the normal maximum size for the stone and a 2½-in. cube for the coke. The latter is, as a rule, passed through a crusher, thence over a screen for the removal of dust and fine breeze. The kilns are charged through tight bells at the top in fixed quantities and at regular intervals. Cold lime is drawn from the kilns, either at regular intervals or continuously, the latter method being the latest practice. The draft is induced by direct suction of the large blowing engines or compressors, used for forcing the gas into the carbonators. The kilns are at all times under the same complete chemical control characteristic of all other departments, the following hourly records being made day and night.

The correct ratio of coke to stone is determined by analysis of the coke, and adjustment of the burden, i.e., coke to stone ratio, until the maximum volume per cent of CO_2 is obtained in the exit gases consistent with a well-burned lime at the kiln discharge. Once this ratio is obtained it is most rigidly held in balance by constant tests and observation. Both stone and fuel are either weighed, or carefully measured as charged.

The volume per cent of CO_2, CO and O is determined hourly by means of an Orsat apparatus equipped with three absorption vessels containing the usual solutions for these gases—caustic potash for CO_2—cuprous chloride for CO, and an

* Paper at the annual convention of the National Lime Association, New York City, June 15, 1921.

† Published in Rock Products, April 12, 1919, page 37.

alkaline solution of pyrogallol for oxygen. The vacuum is measured in fractions of an inch of water and will vary from one-tenth to three-tenths of an inch, depending largely on the character of the stone and its tendency to fines in burning. Temperatures are measured by recording pyrometers and are maintained constant, once the kilns are adjusted to the rated output dependent on the scale of operation. All of the various operations in an alkali plant are peculiarly interdependent one on the other, and inefficient working or a break down of any portion is almost immediately reflected throughout the entire process. Moreover the disturbance will be felt for some time after the defect has been remedied and with consequent loss in output.

Another reason for control is obvious when we consider that it will take the same amount of steam per revolution of the compressors to pump a lean gas as a rich gas, and the pounds of CO_2 delivered with the former at the same r.p.m. are less than with the latter; moreover, the efficiency of carbonation is much better with a rich gas than with a lean gas. The quantity of the CO_2 gas in the exit varies inversely with the amount of coke charged as fuel, that is, the less coke the richer the gas, consequently constant efforts are made to use as little coke as possible and completely burn the stone. It is essential that the stone be completely converted to lime, or nearly so, as otherwise the consumption per ton of soda ash would be materially increased, which would result in an increased cost of finished product. The importance therefore of a careful balancing of the fuel and stone essential to a high exit gas, i.e., a gas with a high CO_2 content, and securing at the same time a well-burned lime, can be readily appreciated, as they not only vitally affect the general efficiency of the entire operation, but are closely related to cost of finished product. Only stone that is clean and free from dirt is used; the presence of foreign matter would cause clinkering.

With a high calcium, free burning stone, and with coke low in sulphur, and containing less than 8 per cent ash, fuel ratios as high as 1 ton of coke to 12 and 13 tons of stone are not uncommon monthly averages. I have a record of one month where the ratio was 1 to 14. Daily chemical analyses are made of the limestone and coke used. As has been noted, the per cent of CO_2 gas by volume in the exit is tested hourly. Nothing is left to chance, and the entire operation is under absolute and definite control by means of accurately taken and carefully recorded readings.

Large Amount of Lime Made by Alkali Manufacturers

I have stated that the alkali manufacturers are among the very largest, if not the largest, individual producers of lime. In confirmation of this the files of the War Industries Board give the gross production of alkali, in the form of carbonate, bicarbonate and hydrate, figured as soda ash, in 1918 as approximately 2,500,000 tons. With the best high grade calcium stone the consumption per ton of ash can be, under exceptionally good working conditions, reduced to 1.2 tons of limestone per ton of soda ash. This, however, I think on the basis of past experience, is lower than the average obtained in this country. I have, therefore, taken the consumption of stone at 1.3 tons per ton of finished ash. At this ratio a yearly output of 2,500,000 tons of soda ash would call for 3,250,000 tons of limestone, equivalent to 1,625,000 tons of lime. The largest manufacturer of alkali in this country has a normal production of 1,000 tons of lime per day.

The Geological Survey reports a somewhat larger quantity, 3,437,000 tons of limestone, used by the alkali manufacturers in 1918, equivalent to 1,718,500 tons of lime. Besides this the lime figures of the survey show 145,031 tons of lime used by alkali manufacturers in addition to that produced from their own kilns. The corresponding figures for 1919 are approximately 2,260,000 tons of limestone and 95 000 tons of lime.

From data furnished by the National Lime Association I estimate the commercial lime production of the country in 1918 at 3,204,000 tons, or including that produced by the alkali manufacturers 4,829,000 tons, from which it will be seen that the alkali industry produced approximately one-third of the total, or, if stated another way, the lime used by the alkali manufacturers was equal to one-half of that burned for commercial purposes.

Efficient Kiln Operation

It would seem axiomatic that a kiln of the shaft type, other things being equal, will have the highest fuel economy when so operated as to be cold at the top and cold at the bottom, and as a correlary its capacity will, under these conditions, be greatest when discharging continuously.

Also it may be stated that a kiln will be most efficient as regards fuel consumption where the fuel is burned in direct contact with the stone. Moreover, it will be seen that an efficient kiln is perfectly regenerative in action, the whole of the heat being conserved.

It will be interesting to determine how nearly the operation of the alkali manufacturers approximates the foregoing ideal conditions: First, it may be noted that in three particulars at least these conditions are fully met: A kiln cold at the bottom, fuel burned in contact with the stone, and continuous discharge. Furthermore, since all air for combustion is drawn in at the bottom, the kiln is perfectly regenerative within the limits of the temperatures of the exit gases.

Taking the heat of decomposition of calcium carbonate as 775 B.t.u. per pound, the heat of decomposition of 1 ton of limestone will be $775 \times 2000 = 1{,}550{,}000$ B.t.u.; the average temperature of the stone as charged will probably approximate 50° and its specific heat 0.22; hence the range is $1904 - 50 = 1854°$, and the heat required to bring the stone to temp. of decomposition is $1854 \times 2000 \times 0.22 = 816{,}000$ B.t.u. and the total heat $816{,}000 + 1{,}550{,}000 = 2{,}366{,}000$ B.t.u. One ton of coke will yield on burning 29,000,000 B.t.u., which is enough heat to decompose 12.26 tons of stone under the ideal conditions mentioned.

It will be noted that the foregoing figures do not check exactly with the results obtained by the alkali manufacturers, and that their results as regards fuel economy are apparently in excess of those indicated under the ideal conditions assumed. However, it may be pointed out that the average of stone charged will probably range around 95% $CaCO_3$ and that the decomposition is not complete and also assuming this at 95%, we have $13 \times 0.95 \times 0.95 = 11.73$ indicating a kiln efficiency of

$$\frac{11.73}{12.26} = 96\%$$

It would seem from the foregoing analysis that the argument for chemical control in the burning of lime, as exemplified by the best practice of an industry using a tonnage equal to one-half of all the lime produced for commercial purposes, is clearly drawn and worth the serious consideration of the members of the National Lime Association.

Luckey Lime Plant Opens

THE plant of the Luckey Lime and Supply Co., Luckey, Ohio, recently constructed at a cost of $500,000, has been placed in operation. The plant has six lime kilns with a total daily capacity of 150 tons and a stone crushing plant, the capacity of which is 250 tons per 8-hr. day. A full description of this plant will appear in a subsequent issue of Rock Products.

Inferior Road Materials Due to High Rates in Texas

MANY Texas cities and counties are forced to use inferior road-building material because of the present high freight rate on gravel and stone for road-building purposes, according to T. L. Waugh, Houston street commissioner. Houston is now being forced to use inferior shell for street building, it is said.

Commissioner Waugh protested the present rate before the Interstate Commerce Commission and asked for a 30 per cent reduction.

Plant of the Rockland-Rockport Lime Corporation

Monunt Gas-Fired Kilns—Traveling Skip-Hoist Stone Feeder and Several Other New Mechanical Features

THERE IS rapidly nearing completion at Rockland, Me., a lime plant that is likely to prove one of the star exhibits of the American lime industry. It has a number of mechanical features of unusual interest.

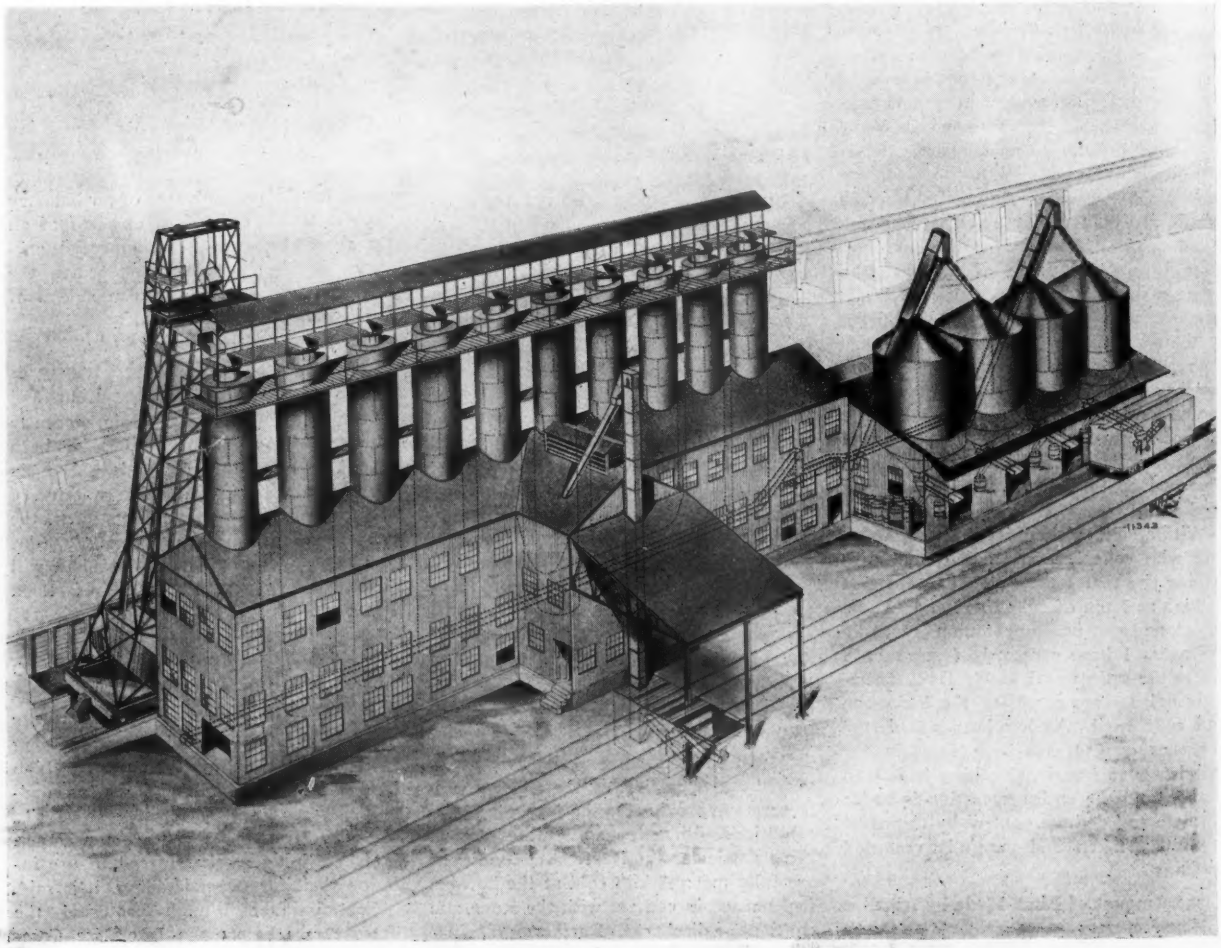
This plant represents the efforts of some of the best technical and engineering talent in the country. It is designed to give perfect chemical control of the process of lime burning. The plans and scheme of operation have been investigated and approved by the firm of Arthur D. Little & Co., Cambridge, Mass., one of the foremost firms of industrial chemists in America.

The view below shows an isometric sketch of the plant as it will ultimately look. At present only the six center kilns and the lime tanks are erected. The two gas producers at present installed are expected to serve the entire battery of 10 kilns.

Rockland, Me., the home of the new plant, is the center of one of the most famous lime manufacturing districts in the world, as well as being one of the oldest in the United States. The first lime kiln recorded in the history of Rockland was built in 1732, and its product was shipped to the Boston market. Ever since then Boston and New York have known and always demanded Rockland lime.

The type of kiln generally used in Rockland from 1854 until the present day is a limestone masonry shaft with two fireboxes on opposite sides. They were originally designed to burn wood fuel, but coal has been most frequently used during the last few years.

The following pages comprise a paper read at the annual convention of the National Lime Association at New York City, June 15, 1921, by George B. Wood, president of the Rockland-Rockport Lime Corp., and give, with views taken by the editor during a recent visit to Rockland, a full and complete description.



Isometric sketch of the new Rockland lime plant (courtesy of the Link-Belt Co.)

Hydrating plant at the left and new kilns and lime plant at the right

The Fine Art of Lime Burning*

As Exemplified in the New Plant of the Rockland-Rockport Lime Corporation, Now Under Construction

By George B. Wood
President, Rockland-Rockport Lime Corp.

THE NATURAL AMBITION of every man in the lime business should be to manufacture his product at the cheapest cost possible, to sell it at the highest price possible, and to standardize its quality to the highest degree of perfection. We all know of some limestone deposits where the quality of the rock is so pure and so uniform that it may be classed as foolproof. Any of the ordinary old-fashioned kilns, any kind of fuel and any ordinary lime plant terrier from Italy or Poland will produce good lime of uniform quality from such rock. Elimination of waste makes costs automatically low and lack of complaints with repeat orders from the trade makes the price automatically high.

The rest of us envy these blessed few. What we are more used to hearing is, "How can you sort your rock if you put in a crusher at the quarry?" "My lime must be burned with wood, it can't stand the high temperature." "We have to stick our kilns to get any results at all." "We must have some core to get good lime."

The following are also most familiar-sounding remarks:

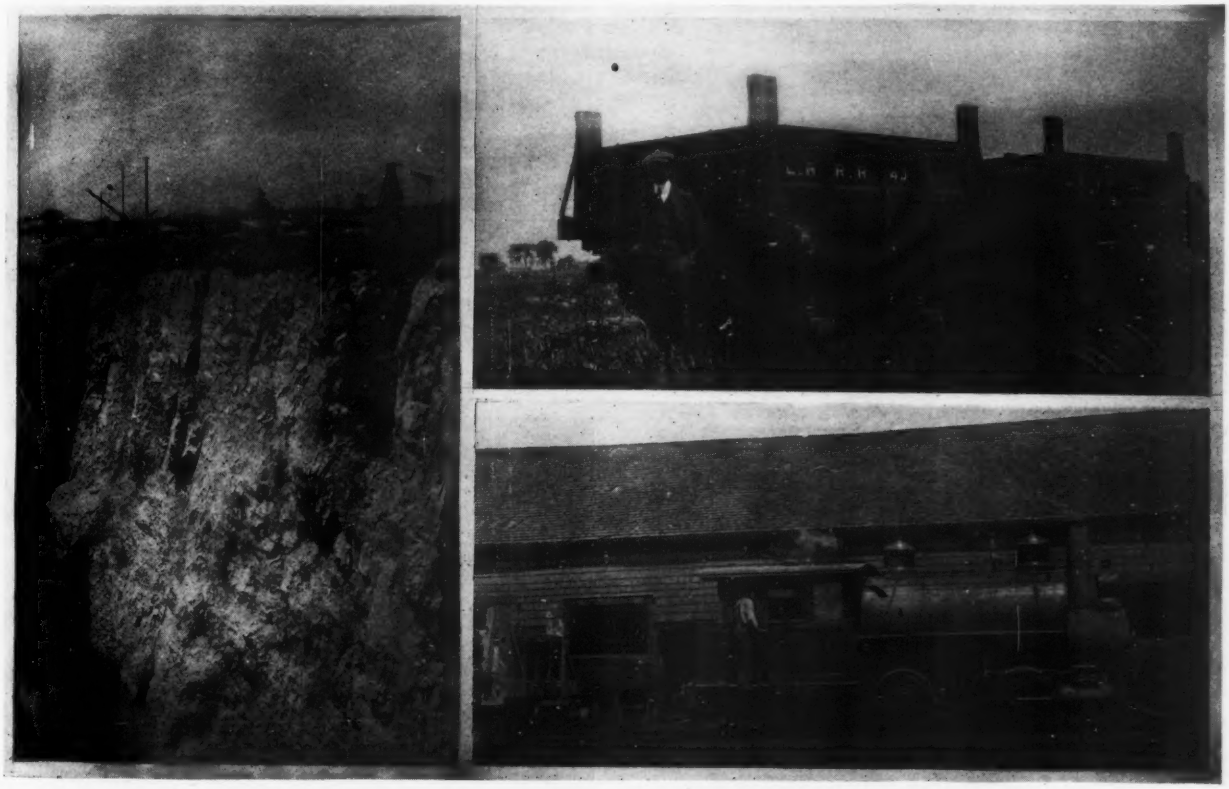
"My lime doesn't act right in the bleach business."

"They can't use my lime in paper mills."

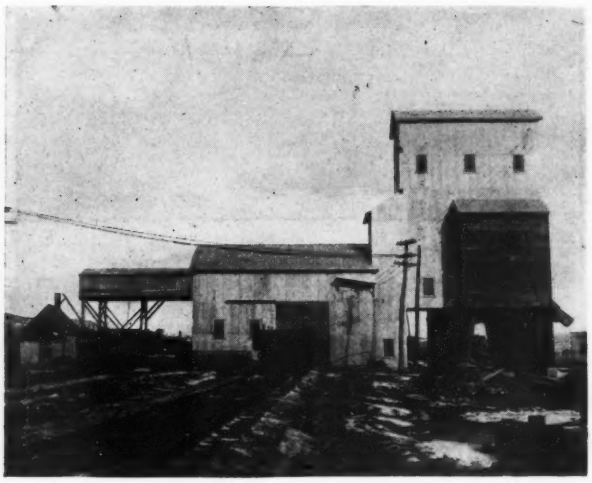
"My lime is not adapted to the tanners' use."

We are forever hearing lime men agree with that bromide remark of the architect and the author of scientific fiction: "Lump

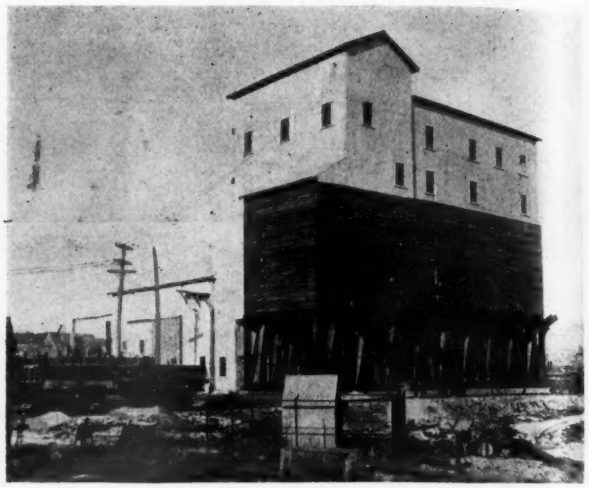
* Paper read at the annunal convention of the National Lime Association in New York City, June 15, 1921.



A typical quarry view—Type of standard-gauge car and type of locomotive used



Rockland crushing plant showing screenings conveyor



Crushing plant showing facilities for loading out cars

lime must be slaked for a week before using."

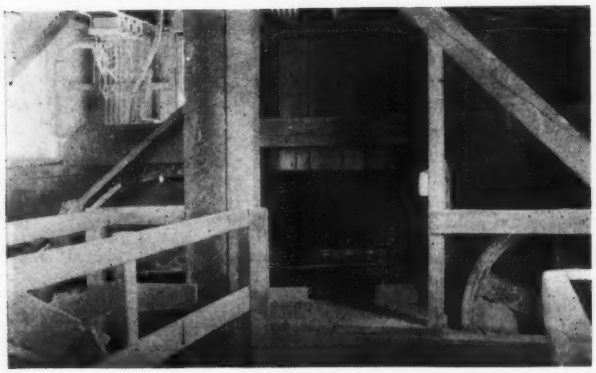
All of these quotations reflect the point of view of men engaged in a business, the fine art of which has advanced but little since the days of Julius Caesar. Dr. Lazell in his book on hydrated lime quotes Vitruvius as authority for the fact that lump lime must be slaked for weeks before it is fit to use for building. In those good old days limerock was burned in heaps covered with sod and none of it was fit for immediate use.

We have progressed so far today that several hundred thousand barrels of lump lime are used every year in this City of New York practically hot from the mortar bin onto the wall, and the jobs are successful. This is possible only because manufacturers select for the New York market exclusively that lime from each batch at the kiln which is properly burned. Cheaper markets must be found for that which is not properly burned and happy will be the lime man who can say: "At my plant we can scientifically burn every piece of rock just the way we want to."

Let us banish the thought that the only way out of the wilderness is to hydrate our lime. Let us get over the practice of classing our product as a supplemental building material to be mixed with Portland cement. Don't let us sit idly by

Sheriden shaking grizzly for screening kiln stone

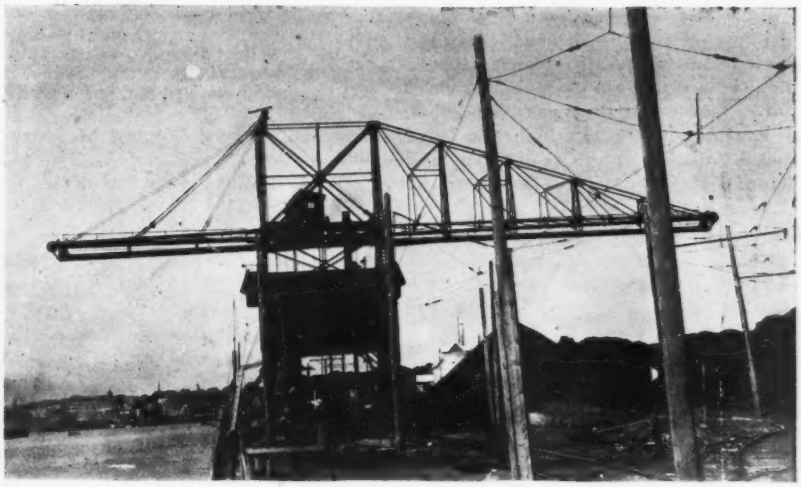
Fines from grizzly going to rotary screen



Another view of the grizzly installation

Feed end of rotary screen for fine stone

Same cars for stone and coal



Coal unloading traveler on the water-front

while one city after another changes its building code to eliminate lime mortar. Good old-fashioned lump lime putty is a product in a class by itself; hydrated lime putty is merely its nearest competitor in quality. The brick wall laid in lime mortar is a better wall; the mason can lay more bricks and do a better job, and the contractor can save the owner money over a wall laid in cement mortar. All our troubles with lime are due to improper and ununiform burning. There is a right way and a wrong way to slake every variety of lime, but our troubles when we have them do not come from the lime which is properly burnt.

Individual Limestone Requirements

Each individual limestone requires its own peculiar heat treatment to produce a lime of desired qualities. A certain limestone, for example, may best be hard-burned slowly at low temperature for furnishing lime to a causticizing plant.

Map of Rockland, showing location of quarries, plants and other property of the Rockland-Rockport Lime Corp.

It may best be light-burned at low temperature for building lime and it may best be light-burned quickly at high temperature for lime to go to the hydrating plant.

Dr. Holmes, of the Lime Association, is undoubtedly going to discover a lot of valuable truths along these lines, but such knowledge will profit us little until we build lime-burning plants capable of operating under stabilized conditions of physical and chemical control.

With these requirements in mind, as well as maximum heat efficiency and minimum labor-operating costs, what should we demand of the modern lime kiln?

First. Continuous mechanical feed of rock and continuous mechanical discharge of lime. When lime is properly burned it should be immediately taken away, not left to soak in the heat and gases for four to six hours.

Second. Positive control of temperature.

Third. Positive control of draft.

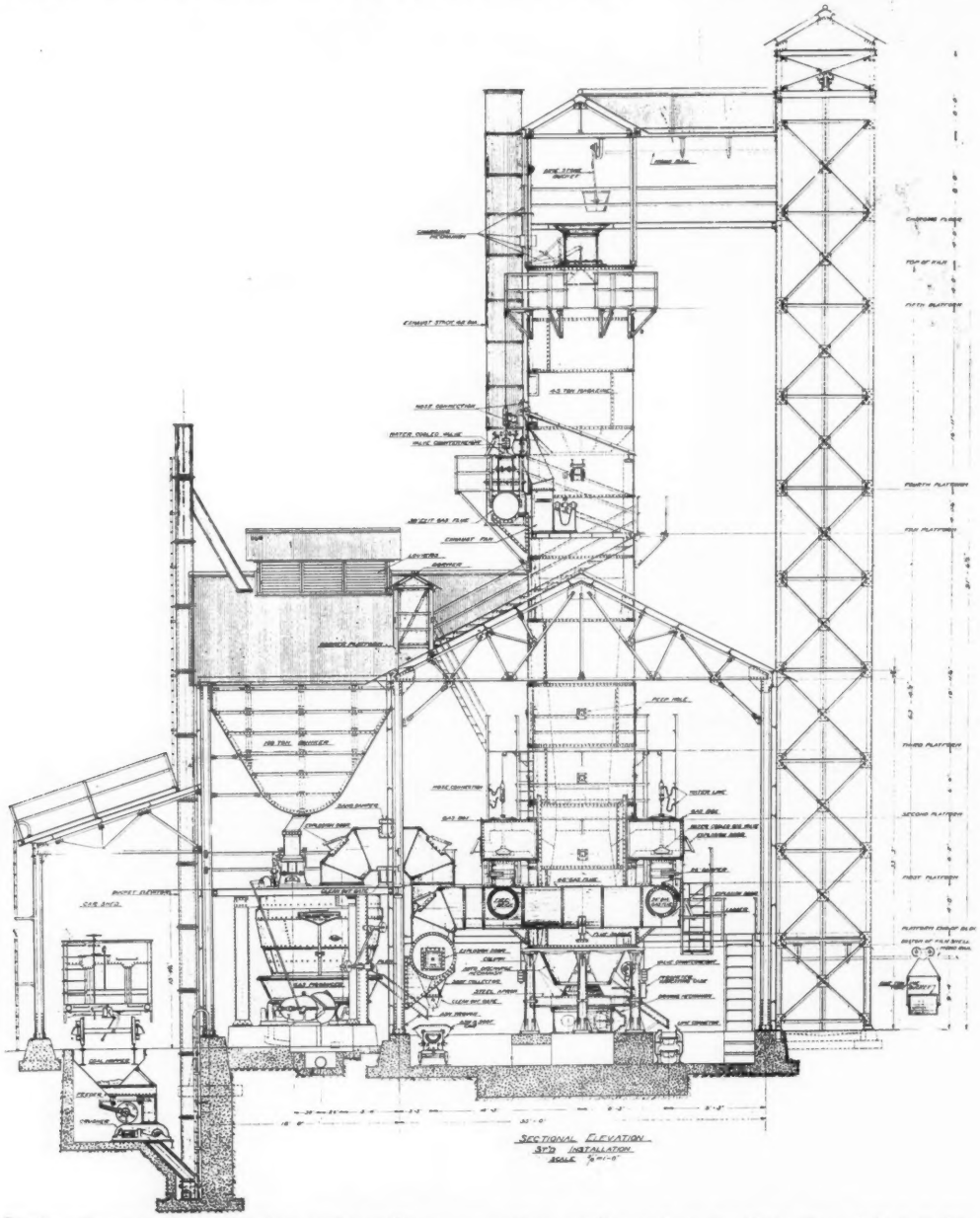
Fourth. Positive control of burning period and lime discharge.

Fifth. Positive control of combustion.

Sixth. Minimum temperature of flue gases and cool lime ready for immediate handling and shipment as it leaves the kiln.

New Rockland Plant

The new plant at Rockland, now nearing completion, is capable of meeting all of these requirements and, based on the results of an accurate test with our stone, will undoubtedly show a saving of 50 per cent in labor cost and very probably a saving of 50 per cent in fuel consumption over the former old-fashioned methods with hand-fired kilns.



Section through plant showing coal handling, gas producer, kilns and stack. Note the original design for kiln-stone charging; subsequently changed to the traveling ship hoist

The first requirement for maximum efficiency and uniform quality is uniform-sized stone going into the kiln. Our new rock-crushing plant at the quarry is not unique in any particular feature except for provision in the storage bin of three separate compartments, making possible three different classifications of quality of

rock to be transported to the kilns.

The plant consists of a 48-in.x42-in. Traylor jaw crusher set entirely below track grade, permitting a trainload of rock (25 to 30 four-yard standard-gauge dump cars) to run down by gravity, dumping one car at a time into the crusher. An air-hoist facilitates dumping of cars and an electric car puller starts the train whenever cars fail to move by gravity. Each car holds between 5½ and 6 tons of rock and we recently dumped through the crusher as a test 25 cars in 22 minutes.

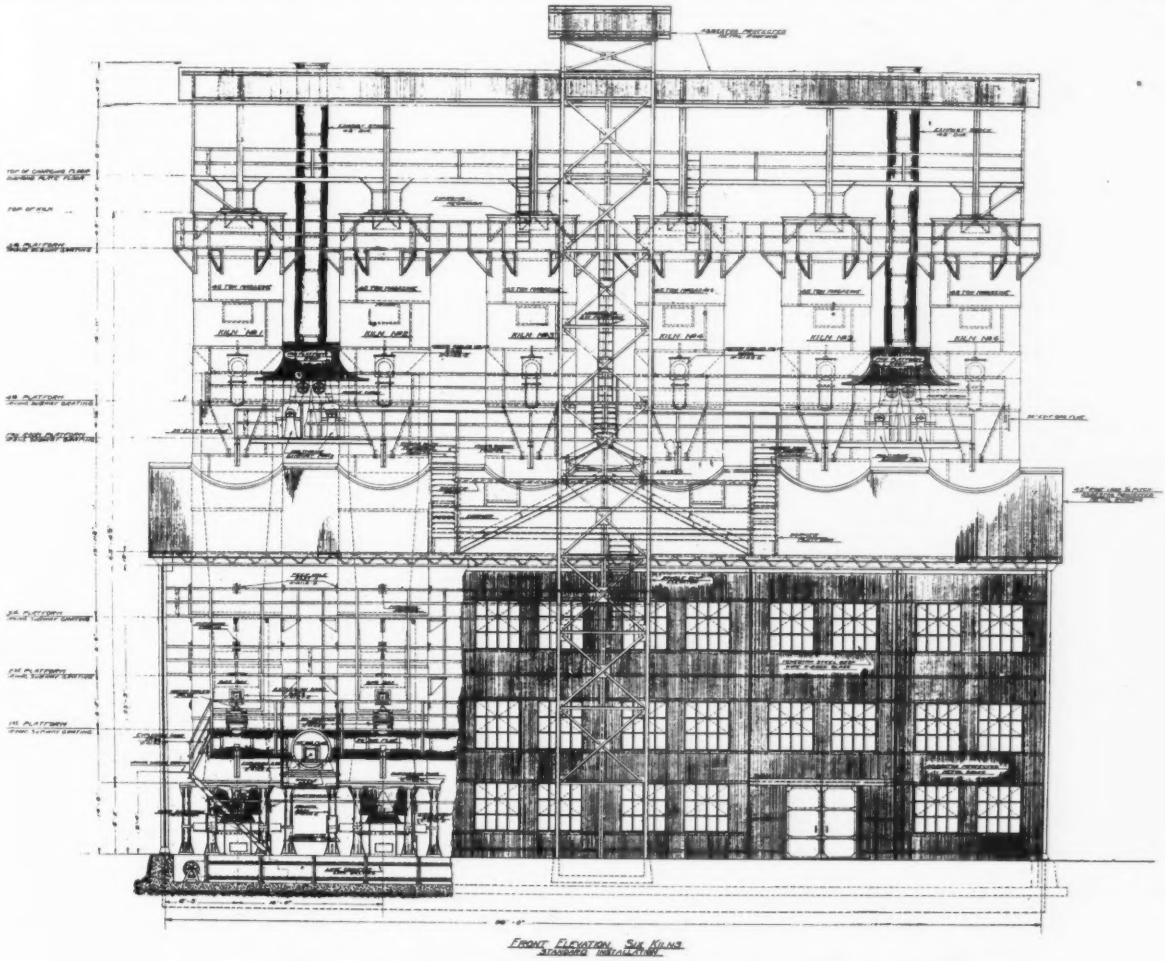
Water-Front Plant

The kilns, hydrate mill, barrel factories and warehouses are all located at the water-front of Rockland Harbor, and the quarries are situated a mile and a half inland. The lime company owns and operates a standard-gauge steam railroad, a belt line around the city, which is a switching terminal and feeder for the Maine Central Railroad. Coal and cooperage stock are received by water, lime is shipped by both rail and water, and the Lime Rock Railroad distributes rock and coal and handles all the freight cars for the various plants. This railroad has 13 miles of mainline and sidings, four locomotives and 495 four-yard dump cars, which are maintained and repaired in the company's own shops.

With this explanation of plant conditions, it will be understood why we have adopted at the new kiln plant a rather new and unusual method of rock storage and kiln-charging machinery.

New Lime Kilns

The new lime plant comprises a battery of six Mount kilns, with two Morgan mechanically-poked gas producers centrally located, and one horizontal tubular boiler. The plant is designed with provision for two additional kilns at either end to make a future battery of 10 kilns. The boiler is fired with producer gas, but



Front elevation and part longitudinal section of plant; gas producers in the center

A pan bucket elevator, 84-ft. centers, with buckets 42 in. wide, carries the rock to the top of the structure, where a shaking grizzly separates the 3-in. and smaller stone from the kiln stone. A revolving screen and a small auxiliary gyratory crusher sizes small stone for the crushed stone market. A 14-in. belt conveyor 100 ft. long, discharging into an abandoned quarry, disposes of the surplus fine stone when there is not a market. This spill conveyor eliminates all the additional handling cost in winter time from small stone frozen solid in bins and cars. The storage bins hold a total of 900 tons of

the setting provides for a mechanical coal stoker to be installed in the future when 10 kilns are put on the two producers.

The kilns are 10-ft. outside (5-ft. least inside diameter, widening out at the top to 7½ ft. at 11 ft. above the gas inlets) diameter and 75 ft. high above foundations. The brick lining stops at a height of 55 ft., where the gases are drawn off by induced draft through waste gas flues leading to a duplicate system of motor-driven exhaust fans. The top 20 ft. of the kiln is unlined and holds a reserve storage of 45 tons of rock.

The rock is charged through an air-

tight charging bell at the top of the kiln, which is operated by compressed air. The draft of each kiln is regulated from the floor by a cable leading to a damper on the exhaust flue. Water-cooled valves regulate the flow of gas through tuyeres on two opposite sides of each kiln. Constant gas pressure is maintained at the producers by automatic regulators. Air for combustion is drawn from the bottom of the kiln through the hot lime below the fires, pre-heating the air before meeting the gas for combustion and thoroughly cooling the lime before it discharges from the kiln.

The lime discharges continually through an annular opening at the bottom of the cooling cone on to a slowly revolving circular table. The speed of the table determines the rate of discharge and may be regulated for each kiln independently through the simple shift of a lever. A 24-in. steel pan conveyor receives the continuous discharge of lime from all the kilns and carries it into the lime sorting and packing building, but that is another story which we will come to later.

The coal arriving at the plant is dumped from cars into a track hopper, where it is crushed and elevated by machinery into a 100-ton storage bin over the gas producers. The producers are fed and poked mechanically and also by machinery discharge their ashes at fixed intervals into cars spotted on a depressed railroad track which runs through the kiln building. Soot traps in the main gas flues also empty direct into cars on this track.

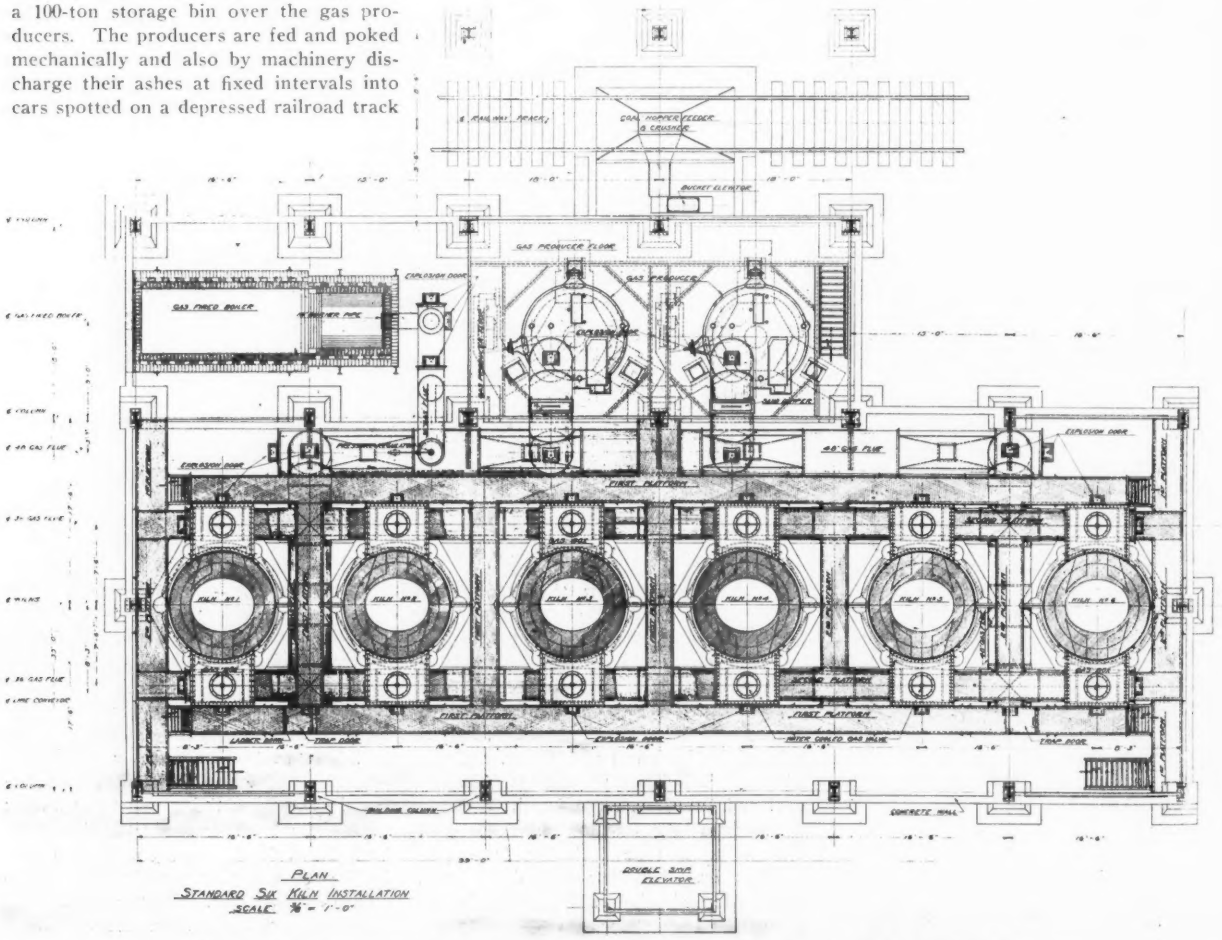
Control of Lime Burning

Each kiln is fitted with two pyrometers, one at the high temperature zone and one at the top. A cabinet at each kiln contains the indicating instrument with a two-way switch as well as a draft gauge permanently connected to the kiln. The high temperature pyrometer of each kiln is also permanently connected by special cable to graphical recording instruments located in the superintendent's office. Thus, the foreman on duty can at all times note the temperature and draft readings to each kiln and make adjustments to maintain pre-determined continuous operating conditions. Also the superintendent may look at the six continuous red ink lines on the chart in his office and know without doubt if the temperature went wrong on any of the kilns during the day or night.

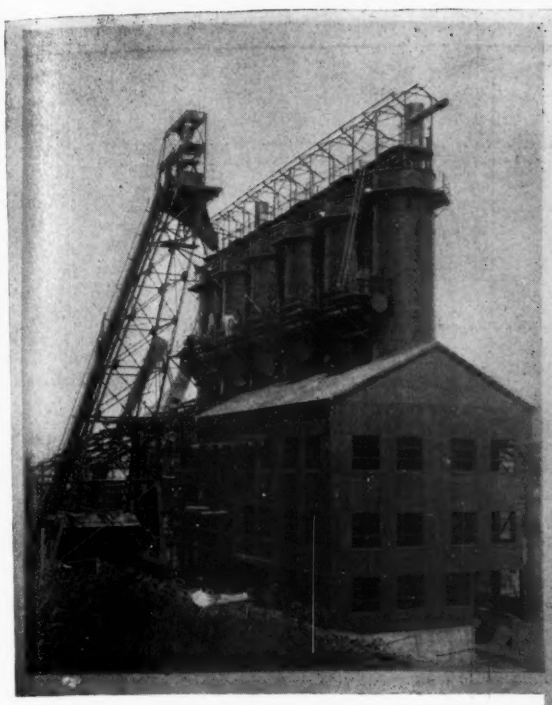
Here is the time to introduce the plant chemist and his three assistants, perhaps more properly termed chemical engineers. The assistant chemist on duty through an eight-hour shift will be the cock of the walk. At fixed intervals he makes quick analyses of producer gas and flue gases, notes the kiln temperature and the lime and knows without guesswork what to do. By his orders the boss kiln tender closes a gas valve here, opens a draft damper at some other kiln, speeds up the discharge of one kiln or slows down another. Again he may order the producer operator to speed up the coal feed on No. 1 producer or open the air damper on the blower of producer No. 2. If draft conditions and flue gas analyses persist in acting queer on kiln No. 5, we may find the assistant chemist and the kiln boss looking in the observation ports and finally discovering on the operating platform at the third level that the kiln is hung up on one side and must be barred down immediately.

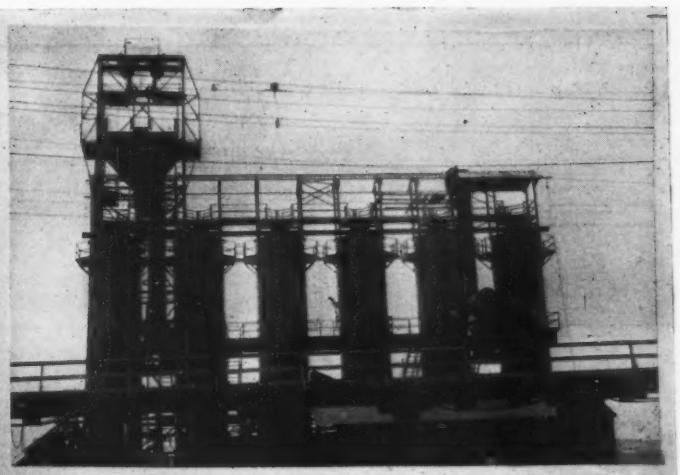
Here then is a kiln plant that can almost talk if it is treated in the manner which it deserves.

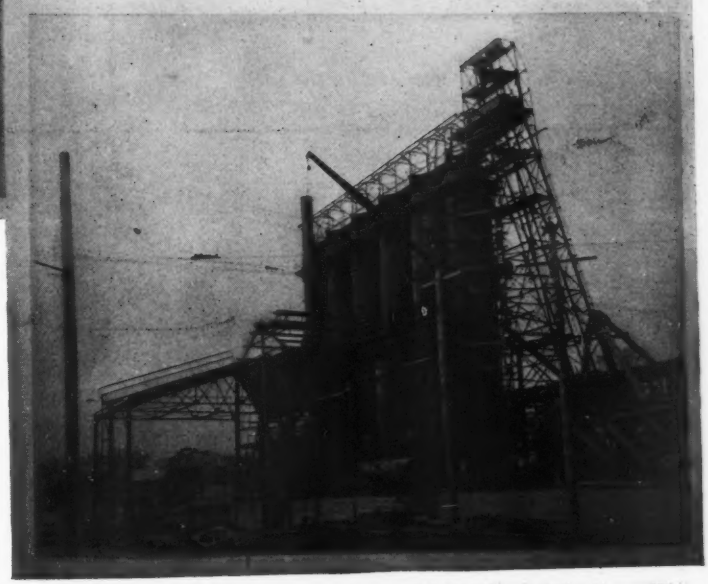
Let us suppose there is a periodic shortage of cars and the lime bins nearly full, we must slow up production. With this plant the temperature may be lowered and the discharge slowed down to operate



Plan of kiln and gas producers showing gas-producer connection with boiler required for gas







Various views of the new battery of Monunt kilns showing the skip hoist device for charging. Pictures taken about the first week in June

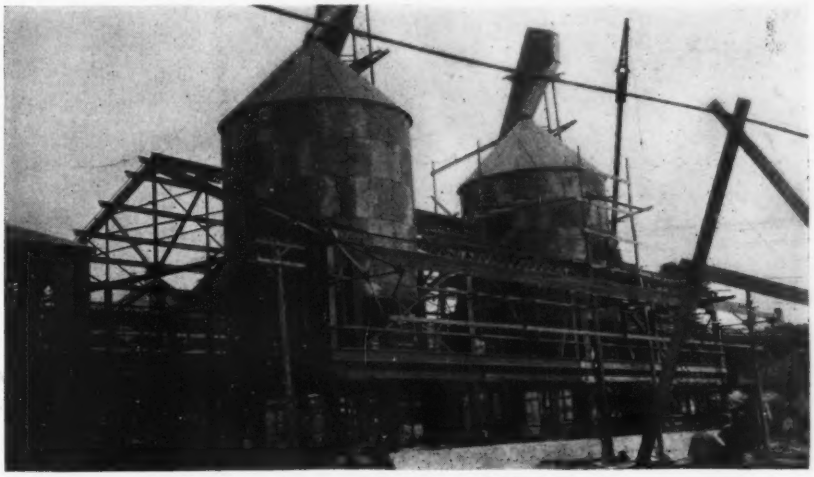
the whole plant at one-half production. The lime may be somewhat different than that burned at high temperature, but it will be good lime, not like some we used to get when we had to plug the old-fashioned kilns. When cars come again in two days the young assistant chemist orders the temperatures up, the drafts brought back and then the lime discharge gradually increased until early in the afternoon the plant is again in full swing at maximum production. Perhaps, however, just to romance a little, kiln No. 1 is still kept at lower temperature because that kiln is filling an order for lime to the toothpaste trade and Dr. Holmes has very definitely determined that lime for this use should be burned under such conditions.

Kiln Charging Device

We will now go outside the kiln building and observe the method of charging rock into the kilns. This feature is perhaps the most unusual part of the new plant design. Consideration has been given to the fact that this plant is located near the residential section of the city and therefore in addition to no smoke there must be as little noise as possible, particularly during the night.

Large rock storage provided at the kilns overcomes a temporary breakdown on the railroad system and the kiln charging mechanism is designed for a 10-kiln plant with capacity to charge 700 tons of rock within an eight-hour workday. The rock arriving in trainloads at the kilns is dumped from an overhead trestle into a side-hill storage extending the full length of the kiln battery and capable of storing in the neighborhood of 3,000 tons.

A concrete base and wooden bulkhead with discharge gates for each kiln, forms

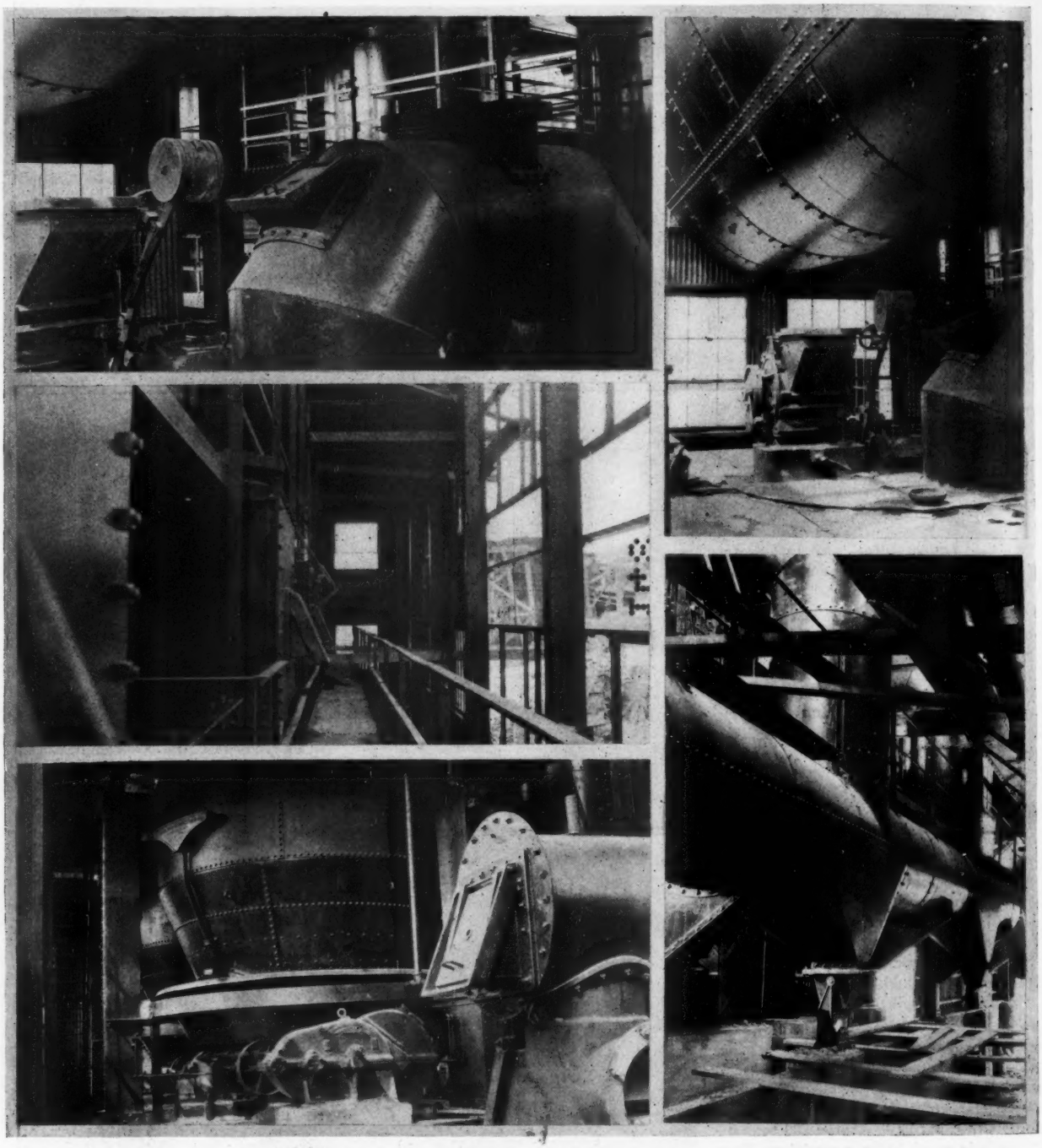


Steel tanks for lime after it comes from the kiln building

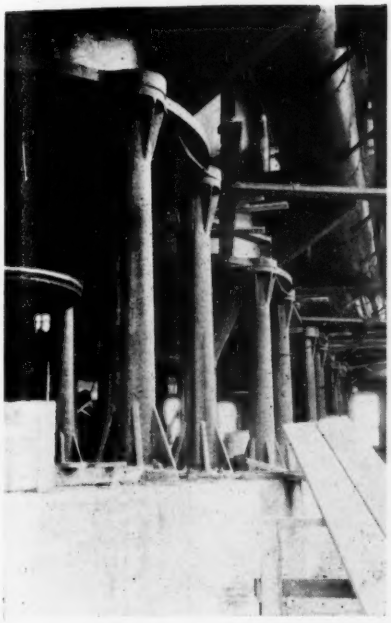
the front wall of this continuous storage bin. Between this bulkhead and the kilns is located a traveling skip hoist, which acts as a single mechanical charging machine for the entire battery of kilns.

This is a steel structure 105 ft. high, the base measuring 34 ft.x26 ft., counterweighted with concrete and supported on car wheels which travel on 80-lb. railroad rails. Electric hoisting and haulage engines, with automatic control, are located in a steel house on the base of the structure and power is taken from trolley wires attached to the kiln building. Two skip cars hung in balance travel on separate rails to the top of the structure, where they dump automatically into a common receiving bin discharging into the rock hopper of the kiln.

Operation is entirely automatic from push button control. The operator on a platform at the base of the structure opens a rock gate and fills the skip on his right with three tons of rock, closes the gate and pushes a button. The skip travels to the top, dumps and stops, bringing the second skip to the bottom opposite the gate on his left. The operator fills the second skip, again pushes the button, and so continues until the kiln is filled. He



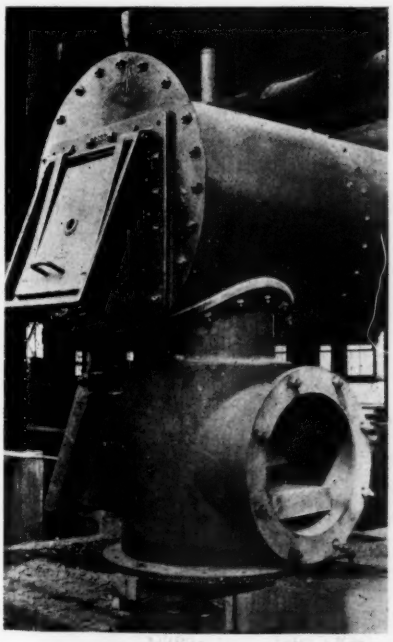
Views of various details of the gas producers and connections with kilns. Two top views show gas producer coal feed and bottom of coal bin before hole was cut in the bin bottom. Note the middle view and the drawing on page 38 to understand the fire-box effect on the fire-end of the gas inlets at the kilns



Kilns supported on cast-iron columns

then takes the handle of a controller and moves the whole structure as a motorman moves his trolley car along the rails, until it comes abreast the next kiln and another pair of gates in the rock bin.

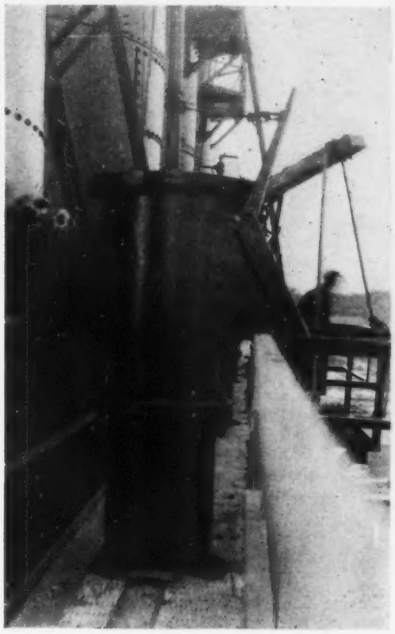
One man operating the machine and one man at the top of the kilns will constitute the labor necessary at the kiln plant to put 700 tons of rock into 10 kilns. The machine will ordinarily travel the length of the row of kilns filling them in the morning and repeat the operation in the afternoon. The storage magazines in the kilns will keep them fed with rock from that time until the next morning.



Connection on gas flue for steam-boiler operation

Will Burn Small Stone

The mechanical draft and mechanical operation of these kilns makes it possible to burn the smaller sizes of stone from the quarry. This is true particularly with stone which does not fine up in burning, and we expect to be able to burn our Rockland stone in sizes down to as small as two inches. If practical operation proves it advisable, the stone can be classified at the crusher plant and bin partitions provided at the kiln storage, making it possible to run certain kilns independently on certain sizes or certain quality of stone.



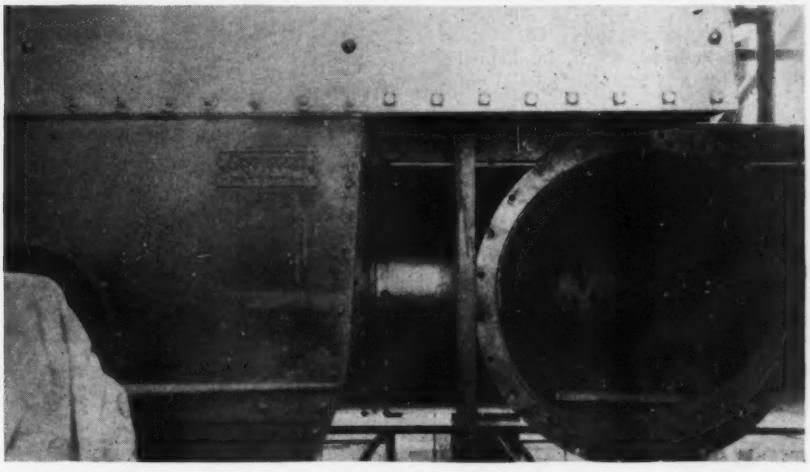
Exhaust pipes on kiln draft

Furnace door on kilns

Picking and Packing Lime

This completes the details of the lime-burning plant and we will now follow the lime on its course into the storage and packing building. Here we see how simplified the process may be when lime comes continuously and cool from the kilns instead of by periodic batches drawn hot on to a floor or into bins to cool.

The storage and packing building is a two-story fireproof steel structure, 108 ft.x60 ft. and adjoining the kiln building. As the lime conveyor enters this building it rises and discharges the lime over a bar



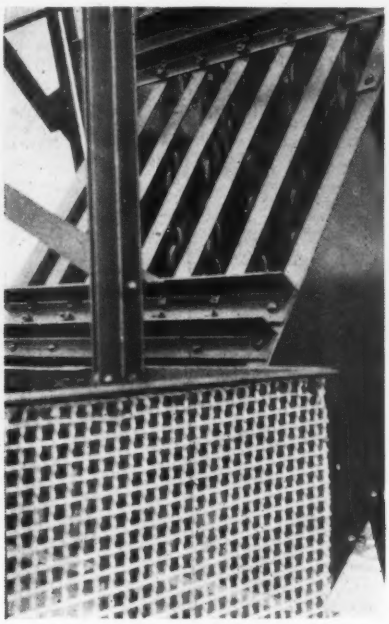
Suction fan for draft on kilns. Opening at the right is for a second unit when additional kilns are added. There is a fan at each end of the battery of kilns

Top runway on kilns

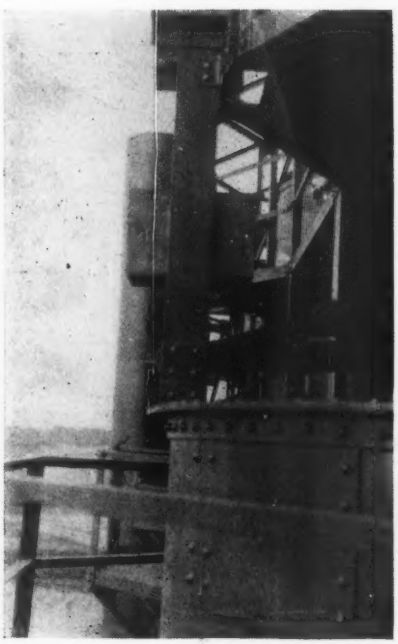
grizzly, separating it into fines and lump deposited respectively onto two parallel pan conveyors which are elevated three feet from the floor, and act as a sorting table.

Here will be stationed one man on continuous duty for each eight-hour shift, sorting into selected lump lime and common lime quality. The larger lumps are broken to remove possible core, black lime or possible brickbats are discarded and second-quality lump lime is transferred from the selected side to the common lime side of the sorting table.

These conveyors discharge into bucket elevators which carry the lime to the top of four overhead steel storage bins, each with a capacity of 500 tons. The storage bins are cylindrical, 25 ft. in diameter, with cone top and bottom. Special gates and shaking chutes discharge from the bins through the side of the building, loading direct into box cars with a Pratt box car loader or direct into dump cars to go to the hydrate mill. Each bin has two barrel-filling chutes so designed that the operators may sort the lime as packing. This makes possible a second inspection of all lime filled into barrels. The second story of the building is for empty barrel storage where one or two men are on duty to receive and pile new barrels from the barrel factory and to pass them into the feeding chutes leading to the lime packers on the lower floor. The lime packer takes each empty barrel from the chute, similar to taking a paper drinking cup, and fills it to required weight on a special fixed counterweight scale. Trimmers put in the heads and trim the barrels and stevedores truck it direct into cars which may be spotted on railroad tracks at either side of the building. All



Device for obviating noise and retarding rush of stone while feeding the kilns



Link and counterweight for balanced valve on stone inlet

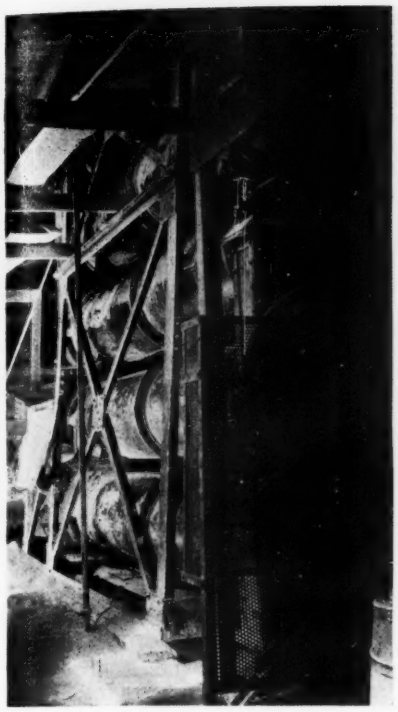
lime will be packed only for immediate shipment except when anticipating rush shipments such as 7,000 large barrels to be loaded into a barge cargo for the New

Balanced valve inlet for stone at top of kiln

York market or 2,000 small barrels for a schooner shipment to Boston.

In such cases it is possible to store on the floor of the packing house 2,500 barrels at a time. Provision is being made to install at a later date a slow-moving conveying platform which is level with the floor and follows a continuous rectangular course around the central stor-

Elevators for placing lime in tank storage



Kritzer lime hydrator

Bagging machine for pulverized lime for agricultural purposes

age area. The man at the chute will fill a barrel with lime and place it on the moving platform, which immediately takes it out of his way. The trimmers will head-up the barrels on the platform as it travels along and eventually the finished packages reach the desired place where they may be put direct into a car for shipment or onto the floor for storage.

Excepting the cases of emergency shipment, all packing and shipping will be daytime work six days a week. On Sundays and nights the lime goes into storage, the only men on duty being the eagle-eyed inspectors at the sorting table. There should be no loss from old lime air slaking in barrels, and with storage capacity in airtight bins for 2,000 tons of lime, the normal fluctuations of market demand should be discounted, making possible more uniform capacity operation of the kilns.

I am not going to be so rash at this time as to mention any figures for listeners' notebooks, regarding the number of men it will take to operate this plant, or the lime it will produce with a pound of coal. The figures of actual operation would be much more to the point before such a critical audience. We determined by actual test with our high calcium limestone in this type of kiln that more than 30 tons of lime per day can be produced from each kiln and nearly twice as much lime per pound of coal as obtained in old-fashioned hand-fired kilns. Let it rest for now with this statement from Rockland: "Our hat's in the ring and we are out to break all records for efficiency."

Personnel

All the lime, stone and coal-handling machinery was designed and furnished by the Link-Belt Co., Philadelphia.

The plant design in general is the result of the engineering co-operation of G. B. Wood, W. D. Mount and H. D. Pratt.

The general superintendent of the Rockland-Rockport Lime Corp., in charge of operation, is W. C. Bird. Both Messrs. Wood and Bird are engineering graduates of the Massachusetts Institute of Technology.

Tariff on Rock Products Materials

THE TARIFF BILL reported to the House of Representatives at Washington, D. C., on June 29, includes the following items of interest to rock product producers:

Schedule 1, applying to chemicals, oils and paints—a controversial feature of this schedule is the limited embargo on imports of dyes.

Coal tar products, including dyes, are divided into two classes—Class A contains those which are obtainable in the United States on reasonable terms as to quality, price and delivery; all others are placed in Class B. The tariff commission is directed to classify coal tar products in these two classes.

During a period of three years from the passage of the bill no product while included in Class A shall be imported.

There are restrictions over the importation of Class B products designed to prevent the importation of more than a six-months' supply.

The bill appropriates $100,000 for the expenses of the tariff commission in this work. Besides the protection furnished by the three-year limit, embargo dyes are subject to a duty of 35 per cent ad valorem and 7 cents per pound. Duties on chemicals included in this schedule are for the most part considerably higher than in the Payne-Aldrich law. As an example of increased duties, the rate on oxalic acid has been made 25 per cent ad valorem, instead of 1½ cents a pound in the present Underwood act and 2 cents a pound in the Payne-Aldrich law.

This is of vital interest to lime and limestone producers as the coal-tar chemical industries are large consumers of these materials.

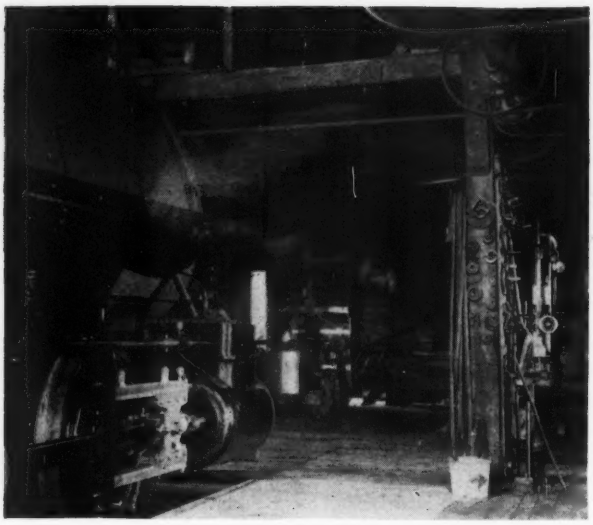
Cement, Lime, Etc.

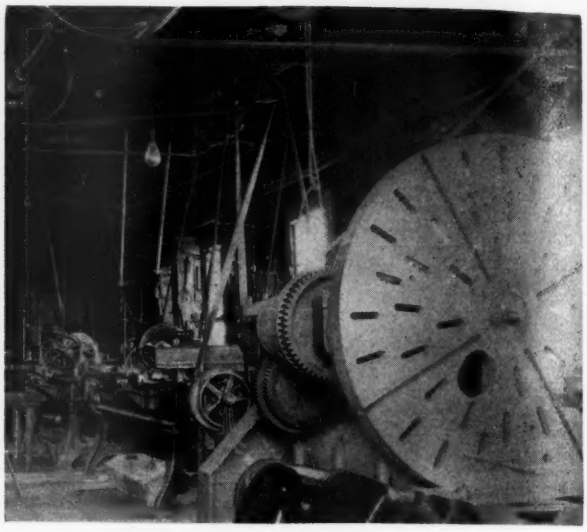
Schedule 2 applies to earths, earthenware and glassware. One of the controversies before the ways and means committee in connection with this schedule was between producers of china clay, or kaolin, in Georgia, Pennsylvania and other states, who demanded protection, and importers of English kaolin, who insisted that the imported product is superior to the domestic clay. The duty was increased from $1.25 per ton to $2.50, the Payne rate.

Increased duties are provided on various kinds of glass, including optical glass, manufacture of which was begun during the war, and which is given a duty of 35 per cent ad valorem.

Cements are taken from the free list and made dutiable. Under the new bill, Roman, Portland and other hydraulic cement in containers will be dutiable at 5 cents per 100 pounds, including weight of barrel or package; and in bulk at 4 cents per 100; other cement, not specially provided for, carries a duty of 17 per cent ad valorem.

Duties on fire and other brick, not glazed, enameled, painted, etc., remain as at present 10 per cent ad valorem; but glazed and other bricks are dutiable at rates varying according to weight and decoration. Rates on tiles are greatly





Engine and machine shop of the Rockland-Rockport Lime Corporation—Another view of the shop

increased, ranging from not less than 20 per cent ad valorem to not more than 50 per cent.

Limestone not suitable for monumental or building use is removed from the free list, and if crude or crushed but not pulverized, is dutiable at 5 cents per 100 pounds; the duty on lime is changed from the present rate of 5 per cent ad valorem to 10 cents per 100 pounds, including weight of containers; and hydrated lime is given a rate of 12 cents per 100, including container.

Crude plaster rock or gypsum is dutiable at 25 cents per ton; ground or calcined, $1.40 per ton; while non-staining portland cement 8 cents per 100; Keene's or other cement, of which gypsum is the component material of chief value, if valued at $14 or less per ton, $3.50 per ton; if valued from $14 to $20, $5.00; if valued from $20 to $40, the duty is $10, and if valued above $40, the duty is $14 per ton. Articles in this paragraph carried a rate of 10 per cent ad valorem in Underwood law.

Duties on pumice are slightly increased, unmanufactured pumice valued at not more than $15 a ton carrying a rate of one-fifth of 1 cent per pound and valued at more than $15, three-tenths of 1 cent; wholly or partly manufactured, four-tenths of 1 cent; manufactures, not specially provided for, 26 per cent—an increase of 1 per cent over present rate.

Rates on crude and unground talc, steatite or soapstone and French chalk are one-fourth of 1 cent per pound; ground, washed, powdered or pulverized, ½ cent; cut or sawed or in blanks or other forms, 1 cent; manufactures, except toilet preparations, if not decorated, 25 per cent; if decorated, 30 per cent.

The duty of freestone, granite, sandstone, limestone and all other stone suitable for monumental or building use, except marble, breecia and onyx, is increased from 25 to 40 per cent ad valorem if hewn, dressed or polished, and from 3 to 15 cents per cubic foot, if unmanufactured or not dressed.

Burrstone in blocks, in rough or unmanufactured; quartzite; rottenstone, tripoli and sand, crude or manufactured; cliffstone, freestone, granite and sandstone, unmanufactured and not suitable for monumental or building use are continued on free list.

The new tariff bills stipulates that all duties shall be based upon the American valuation of the imported commodity, and the value as stated to the appraiser shall be the price, on date of exportation, at which comparable and competitive products of the United States were ordinarily sold and makes provision for ascertaining the value where such information is not available.

Santa Fe Cancels Proposed Switching Tariff on Cement

THE Missouri Public Service Commission issued an order recently requiring the Santa Fe Railroad to cancel a tariff which proposed to materially increase the charge for switching carload shipments of cement from the plant of the Missouri Portland Cement Co., near Sugar Creek, Jackson County, to Kansas City. As a result of complaints filed by cement plants in other states, Illinois and Kansas, the Interstate Commerce Commission found that the switching charge of two cents per one hundred pounds made by the Santa Fe from the plant near Sugar Creek to Kansas City discriminated against plants in Kansas, Illinois, and at Hannibal, Mo., that paid a road haul rate and found that the rate from Sugar Creek on cement, alone, should be advanced to five cents per one hundred pounds.

Installing the largest size track scale now made at the Rockland lime plant

Lime Manufacturers Get Glimpse Into Future of Lime

Third Annual Convention of the National Lime Association at New York Studies Both Manufacture and Promotion of Lime

EVEN IF LIME MANUFACTURERS from all over the United States did go to the National Lime Convention in New York City on June 15, 16 and 17, feeling blue about general business conditions, they nevertheless came away with a well-founded optimism. The reason was that no thinking man could have attended the convention sessions and not have been impressed with the tremendous possibilities in the future of the American lime industry.

Some speakers did not mince matters in criticising lime manufacturers for their apparent inertia in various phases of the lime industry, but these frank talks were taken in good part and the meeting was closed with a feeling that the lime industry was at last started on the right track and with a clear right-of-way toward a growth and success that it has never known.

President Warner's Address

"WE MEET amidst a period of business depression which in many respects is unparalleled. While our industry is suffering keenly, most of us are certainly passing through these trying times with less injury than is being experienced by the business men of many other industries.

"It is such emergencies as the present one which call for strong will power upon the part of the business men to maintain a well-balanced view on the problems of the moment and the assured prospects of better conditions in the future, in order that we may not rashly or radically take steps under the pressure of the moment which might injure us tenfold in the future.

"This applies with equal force both to our own individual business policies and actions as well as in our relations with others in our Association efforts.

"Of all times, the present certainly calls for still greater unity of action and co-operation among the lime manufacturers of the United States. To push forward unitedly and without interruption on definite plans for the upbuilding of the industry is one policy that will lead to the big goal of larger sales during the next few years.

Charles Warner, President of the National Lime Association

"That it is possible to double and treble the consumption of lime products in the next five to ten years is not doubted by those who know the undeveloped fields.

"If any one knows a better program than that which is being so courageously supported by over one hundred and twenty lime manufacturers of our country, and so well administered by the twenty members of your National Board of Directors, then that person has not yet come forward with the better suggestion.

Developing Lime Products

"I can state without fear of contradiction that the present plans in the main are leading us into safe ground for permanent development and extension of the use of lime products and on lines commanding respect and confidence of tens of thousands of lime consumers.

"I have closely watched the development, the results, and the growing, broadening interest of present and prospective lime users throughout the country, and I feel confident that the work is well launched. The past twelve months has seen a steady effort to strengthen the personnel and the detailed working plans of each major department of your association. The work is proceeding hour after hour in the Washington office and radiating throughout the country.

"The work of starting and perfecting district bureaus to carry our messages in all directions and to make the local contacts more intelligently, has also proceeded in a most gratifying manner. Certain sections are not yet covered with this important and intensive field work, but if the same progress with this plan of district development and local group co-operation, can be made in the next twelve months as recorded in the past fiscal year, then we can consider this division of our association program well advanced.

"Upwards of a million pieces of well studied, thoroughly planned and ably executed literature reaching to all points of the United States, with constant and increasing calls for more and more information from present and prospective users, is but one effect of increasing value arising from your association work.

"Step by step millions are learning more and more about lime in the agricultural, chemical and construction fields, and this is gradually and steadily producing a large number of users.

"I will not attempt to detail the work of the organization, as it has become too extended to occupy much space in a President's annual report. The reports of your manager and department heads presented throughout the three-day session of this Annual Convention will speak for themselves.

"By way of illustration, however, I wish briefly to refer to one or two problems, that you may realize the large amount of underlying work conducted by your Association, much of which cannot develop immediately, but will provide practical results as the months and years go by.

Quick-Hardening Lime Plaster

"Take, for instance, the problem of developing the best type of quick hardening lime plaster and mortar. This question is of great importance to the construction field. It has been attempted more or less superficially and spasmodically by many manufacturers as well as in some of the past efforts of your association staff.

"Under past efforts the problem has not been suitably solved for the broad welfare of the industry. It has not been until within the fiscal year just closed that we have been able to lay a broad plan for its study, utilizing fellowships at the Bureau of Standards and elsewhere for taking hold of particular phases of the problem with the intention of gradually bringing all these lines together into a broad basic report that will throw the fullest light on the proposition.

"To get at this problem there are four major lines of study and research that have to be undertaken, and each of these four major divisions fans out into numerous sub-studies and minor researches to uncover any facts bearing on the main proposition.

Members of the National Lime Associat
Commodore, New York C

"The four major studies cover:—

"First—The effect of burning, grinding and hydration in various combinations and in conjunction with other ingredients to locate any refinement in manufacturing processes that may stimulate hardening in the finished product.

"Second—The study of any hardening materials which of and by themselves and upon addition to lime will harden the mixed product. This covers the field of Portland cement, gypsum, Keene's cement and numerous other quick hardening products as additions to lime. Possibilities in this direction are but very slightly known and

Graphical Analysis of a Steam-S

THE INSERT with this issue of ROCK PRO analysis of a quarry operation ever attempted study it and to thus see for himself the conver in such usable and understandable form.

This chart shows the operations of the Doles crushing plant is just outside the city of Chicag capacity about 5000 cu. yd. The record reproduc might be called fairly ordinary conditions. It will averaged only about half its normal output.

The operation of this plant is more regular because it has a large flux-stone business of fai that the chart shows the very great fluctuations tion, except the time operated. It shows clearly employed, total power consumption and total ou show why a plant designed to produce 4000 or 2500 cu. yd. at half the cost of producing 5000 cu

This plant is generally accepted as one of the signed and operated quarries and crushing plants i

The chart is reproduced by courtesy of J. F. Shepard Co. and J. C. Buckbee, of the J. C. B Mr. Buckbee designed the plant and has been th ever since. The chart was prepared by Mr. Buc

Lime Association in Convention at the Hotel , New York City, June 15, 1921

careful research through a long series of tests is essential.

"Third—Since carbon dioxide is the ingredient first naturally employed in the normal hardening of plasters and mortars, but limited by the slow effect and small quantity of this gas found in normal atmosphere, it becomes necessary to determine all materials, such as charcoal, which might absorb carbonic gas in quantity yet hold it so loosely that upon admixture with lime and water a quick release of the carbonic gas would produce rapid carbonization and hardening throughout the mass. There are many materials which can hold carbonic gas in this fashion, but their various effects and manner of action in combination with lime products must be thoroughly investigated through laboratory studies and practical application.

"Fourth—In chemistry, we not infrequently find materials which in small quantities added to some other product will cause that other product to take on entirely new chemical and physical characteristics. It is within the bounds of possibility that we can locate among the numerous chemical compounds such a material which upon addition in small quantities to lime will immediately establish in the lime an entirely new hardening characteristic and solve our problem in that fashion. This would make of lime a self hardener like cement and gypsum, which cementing materials do not need the use of any help from the atmosphere for hardening throughout the mass.

Research Work Now Possible

"By glancing at these broad lines of study and realizing how many separate investigations must be made under each of the general headings, you can comprehend one of the problems that your National Lime Association has set for itself in your behalf. Only a National Association clearing its work through a high class central staff can economically and effectively handle such problems.

"Must we go through with this research to the last possible combination and then piece our data together, possibly combining one feature of Group No. 2 with a feature of Group No. 4 to give us the final answer? Undoubtedly. But we must realize that such investigations cost tens of thousands of dollars and a great deal of patience.

"When the answer is reached it means literally millions of dollars to the industry and probably the saving of its life.

"We must see these things in their broad aspect and continue with patience to work on such problems if we are to accomplish our National aim.

"Again, to illustrate by a type of question that frequently arises which only a National Association can properly handle, I wish to direct your attention to one more plea that has recently arisen.

Co-operation with Government Bureaus

"Herbert Hoover, Secretary of Commerce, has seen that one of the numerous things to be done in this country is to standardize, picking the best methods of economic construction out of practices in the construction field and by developing a sound economic building code, the workmen's homes of the future and construction for all, will be improved and cheapened.

"He calls into being an Advisory Committee. Professor Ira H. Woolson, one of the most experienced and widely known construction research engineers in the country is selected as Chairman. He seeks co-operation with each industry to get its best thought and help. Our National Lime Association is ready; immediately offers its services, and has part of the valuable data already at hand.

"Lime practices properly presented and brought carefully to the attention of this Committee should serve both the country's need and increase our industry's tonnage by the decisions that this Hoover Committee will doubtless reach.

"Lime has been displaced for the sake of a little speed, but at greater other expense in many lines of construction. The Hoover Committee headed by Professor Woolson should help to return the country to more sane and more economic practices. BUT our industry must be co-ordinated and working through a central staff to be able to effectively bring our data and arguments before the Hoover Committee.

"We are prepared to do it. Five years ago it would have been an impossibility for the lime industry to have effectively carried through this co-operation. It must be self-evident that none but a central body radiating its touch and collecting its information from all parts of the United States could effectively cope with the program of the Hoover Committee. So, I congratulate the industry again in the work it is doing and

of a Steam-Shovel Quarry Operation

of ROCK PRODUCTS is possibly the most complete n ever attempted. Every quarry operator is urged to mself the convenience of having a year's operating data ble form.

ns of the Dolese and Shepard Co., whose quarry and e city of Chicago. This company has a normal daily record reproduced is for 1919, the last year of what nditions. It will be seen that during this year the plant mal output.

s more regular than the average crushed stone plant business of fairly large constant demand. Even at eat fluctuations in every factor entering into the opera- It shows clearly relations between the number of men ion and total output, which are very significant. They roduce 4000 or 5000 cu. yd. per day can not produce roducing 5000 cu. yd.

ed as one of the most modern and most efficiently de- crushing plants in the world.

ourtesy of J. F. Talbot, president of the Dolese and of the J. C. Buckbee Co., Engineers, Chicago, Ill. and has been the consulting engineer of the company ared by Mr. Buckbee's staff.

in the preparation it is showing to meet these constantly arising problems.

"Today every live industry has its live association, and the industry that has not confidence in its future, and has not the "punch" to put its program across, shows its weakness and may ring its death knell by inadequate co-operation and inactive association work.

"We should all be consciously proud of our Association growth during the past three or four years. It is a big job and is slow in getting under way. Here and there it will be poorly done and steps must be retracted to make a fresh start, but the constant forward progress is evident to those who but compare the situation in the lime industry today with that of five years ago.

"I welcome you and congratulate you upon your faith and support, and upon the progress that is being made in the research and educational work in behalf of lime products. The commercial results cannot fail to follow the flag."

Working Policies of the Association

E. O. Fippin, general manager of the Association, outlined the work of the staff during the past year as follows:

"The working policies of our several technical departments and our headquarters as well as some of our district offices, has now fairly well crystallized into certain definite lines of work which stand out as most important and which are being pushed forward constantly from week to week and from month to month. In their technical aspects they will be outlined to you by the members of our technical departments. There are, of course, some additional types of educational work very important to take up such, for example, as display advertising. Our staff is now in position to direct the unfoldment of campaigns of that kind whenever you producers are ready to back it up on the financial side. Without our present basic technical organization those advertising campaigns cannot be carried on in the most effective manner.

District Work

"Within the year, district work has been enlarged. Our Eastern Bureau in both districts 1 and 2 is going forward with its very effective work and looks forward to still more thoroughly covering some phases that have been held up by lack of funds. I refer to centralized and systematic local distribution of literature. The Central Bureau made up of districts 7 and 12 has been organized and employs a field man to cover more or less all three departments.

"The Ohio and Wisconsin districts have made a beginning in this direction through the use of a construction field man under a plan underwritten by the Central office whereby they can use less than a full year's time of such a man. I believe the men in those districts will point out their discovery that the average workman and the contractor and architect prefer lime as a general rule and it is only by the more aggressive proposition of substitute materials that they have been adopted.

"In the districts with less members and broader territory the problem of district work presents further difficulties that can best be worked out by wider co-operation and the wise distribution of field time to conserve expenses. The fountain of data from the central office is flowing. It is for you to use it.

"I am frank to say to you lime producers that many of you have not yet thoroughly understood the principles of organization in your association. You have not clearly conceived the broad functions of a central organization and the supplementary functions of district organizations. The one is necessary to command and develop the best scientific data and to make the broad national and larger state contacts, and the other to function in a more local relationship based upon its better understanding of local trade conditions, which must be taken into account in projecting educational work and determining industrial policies for local application.

"It is, of course, essential that the policies of the district work be carried out in thorough accord with the broad policies essential to the operation of the central staff and that the most thorough spirit of teamwork and co-operation exist between the district and the national offices if your industry is to secure the best results. We have been striving to improve and protect that understanding and co-operation, and I want to lay on your minds at this meeting the importance of each individual member in the industry giving special thought to the elements of this organization and to the handling of our several problems in accordance with that organization, not merely out of courtesy to the organization, but because, as you recognize in your business, the adherence to an established procedure insures the highest efficiency and minimizes cross currents and misunderstandings.

Relation of National to District Work

"Whatever I say in this report I speak in appreciation and full sympathy with the district problems and work as well as that of the central organization. To illustrate what I mean, we may take an example from the construction field. It is well known that there is a wide diversity in building regulations and codes in the different cities and that one of the crying needs at the present moment when an enlarged building program is so urgent is to simplify and standardize these codes, to improve construction, and at the same time reduce cost. If, for example, a study of building codes and revision is taken up in New York City through perhaps a district field man, that movement has an interest for and a bearing upon that work in every other city in the country. It ties directly into the work of the New Advisory Building Committee of Secretary Hoover of the U. S. Department of Commerce. The insight of the district officer and the officials of the City of New York into code problems should be expanded and enlarged and improved by having the co-operation and assistance of the point of view of the members of the national staff and their contact relations with similar problems in other cities in the country. Conversely, the central office needs the experience and observations of the field staff.

"In the agricultural field, the principles of liming the soil or the use of lime in spray materials in New England or Missouri should adhere to certain broad principles which are recognized as essential to those practices, but in which there may often be a temptation to special standards and local definitions. This is the day of more complete standardization and simplification and so we have the need for co-operation and hearty conference between our field agronomists and the staff of our agricultural department.

"I mention all of these things merely by way of emphasizing to your mind the importance of the organization in which we are working and the necessity for teamwork in routing all of our problems through this organization. We hold the same responsibility in passing out from the central office to the field man in whatever district he may be located, any information of use to him or any problem which he can best handle.

"There is another angle to this proposition. You set up a central office in your industry with a view to ultimately accomplishing certain results, but the scope of the activity of that staff is limited by the facilities at its disposal, and in a degree by the nature of the problems which must be handled. It has been decreed that the central organization should develop information and make the broader projections of it.

"It is equally vital for you to recognize that the application of this information and of this service locally as to the last plasterer, the last chemist, and the last farmer in your several districts is the individual responsibility of you member companies and of your local district organizations. This is why, for example, we do not send some of our bulletins, such as our agricultural trade bulletins, to a general mailing list of farmers, because we do not have the facilities for consistently managing that mailing list, nor is it possible for us to get in touch with every individual concern using lime, or with every small city where lime has a place in their building codes, but it is none the less true that these individuals should ultimately be reached.

"It is your problem to co-operate in district work in putting out this literature and in developing your local staffs in a way to reach and influence these men soundly to the use of the product of your industry. Just here lies your responsibility in developing and maintaining your district mailing lists as emphasized by Mr. McCallie on

Thursday. Responsibilities are always mutual, and in accepting the responsibilities on behalf of our staff, I take this occasion to lay your responsibilities upon your mind on these vital points.

Investigations—No Claims That Cannot Be Substantiated

"There must be facts before there can be publicity. If there is any one criticism more than another launched at men in commercial enterprises by men in professional and institutional activities, it is that of making claims without sound backing of fact. This is why the term "promotional" has so often been in bad odor because it is often the symbol of deception and bears the stamp of selfish personal interest. If we in the lime industry are to do effective publicity work and not be open to that criticism, we must all the while be reaching back into research channels for new facts and figures applying to our business. Hence a certain portion of our energies and our funds must each year go into those channels if we are to build soundly. Thereby we justify the appropriation made at the last annual convention for research work and their continuation in future years.

"It takes time to get this type of work properly established, but as our technical departments will report, we have definitely established two research fellowships, one at the U. S. Bureau of Standards in the construction field, and one at the University of Tennessee in the agricultural field, and several others of lesser scope are in process of being set up with other institutions. I leave to others the description of the problems being undertaken through these channels."

Technical Sessions

All of one day was devoted to papers and discussions of lime production problems. Papers were read on "Kiln Efficiency and Some New Features in Lime Kiln Construction," by Richard K. Meade, chemical and industrial engineer, Baltimore, Md. (an abstract of this will appear in a later issue); on "Chemical Control, the Key to Kiln Efficiency," by W. D. Mount, mechanical and chemical engineer of Lynchburg, Va. (published elsewhere in this issue); on "The Fine Art of Lime Burning; as Exemplified at Rockland," by George B. Wood, vice-president and general manager of the Rockland-Rockport Lime Corporation, Rockland, Me. (published elsewhere in this issue); on "Problems to Be Considered in Changing a Quarry from Hand Methods to Steam Shovel Methods," by Irving Warner, plant manager, Charles Warner Co., Wilmington, Del. (published elsewhere in this issue); on "Social Service and Labor Efficiency—Relations of Banking Institutions to Social Service," by Willard A. Eckman, welfare specialist, United Security Life Insurance and Trust Co., Philadelphia, Penn.; and on "Social Service as Applied to the Lime Industry," by E. J. Heimerdinger, assistant to the president of the Louisville Cement Co., Louisville, Ky.

Business Sessions—Lime Promotion

All of one day was devoted to papers and discussion on the business aspects of the lime industry—to increasing its use. The program included papers on "Wet-Mixed Lime Mortar—A Chapter of Successful Experience," by W. C. Hay, vice-president and general manager, Blue Diamond Plaster Co., Los Angeles, Calif. (to be published in the next issue); on "An Architect's View of Lime and Its Use," by Knickerbacker Boyd, architect and manager of the Structural Service Bureau, Philadelphia, Penn.; on "Delivering the Goods: The Dealer's Viewpoint," by Tom Wright, manager, Building Materials Corporation, formerly secretary

E. O. Fippin

of the New York State Building Supply Dealers' Association, Rochester, N. Y.; on "Lime in Agriculture," by Dr. W. H. MacIntire, soil chemist, agricultural experiment station, Knoxville, Tenn.; on "Lime and Lime—The Plasticimeter Demonstrated," by Warren E. Emley, U. S. Bureau of Standards, Washington, D. C.; and on "Lime in Water Purification," by C. Arthur Brown, of the American Steel and Wire Co., New York City.

Dealer Relations

Tom Wright's paper contained the summary of his recent investigation of the status of lime among building supply dealers in western New York State. His conclusions were that the lime industry has suffered severely from lack of understanding of the dealer. The average dealer, he said, takes pride in the materials he sells; therefore he will not deceive the public; he must have confidence in the material he offers for sale. Cement is popular, Mr. Wright said, because of the intensive promotional work that has been done, the dealer himself has thus been indirectly educated to think in terms of cement and concrete only. Lime on the other hand, he said, had been allowed to fall into the discard because dealers knew nothing about its different kinds, about its correct use, its advantages, etc.

No material has such a large potential market as lime, according to Mr. Wright. He wanted to know why so much good information regarding lime was kept housed up by the manufacturer instead of being given to the world. Education of the dealer, he said, must come through education of the lime salesman. The salesman must know and make clear to every dealer the many uses of lime. The dealers must be made walking encyclopedias on lime.

Speaking of the tendencies in the building material field Mr. Wright said that lumber would soon be a thing of the past—prices would be prohibitive—and the construction work of the future would be in brick or concrete. Unless lime manufacturers waked up, he said, lime would find little place in the new era of construction. He said materials could not be marketed as they had been in the past; individual effort would avail little; lime must be standardized; the manufacturers must promote it on a broad scale plan; if the dealer can be convinced that it pays to sell lime he will sell it.

Lime in Water Purification

Mr. Brown's paper on the use of lime in water purification dealt with the possibilities of co-operation between the educational bureau which he conducts and the National Lime Association. His bureau is maintained by the American Steel and Wire Co. to promote the use of sulphate of iron, which is a by-product of the wire industry. In most cases lime is used in his process of water treatment.

Mr. Brown estimated that 120 municipal water purification plants in this country, using the sulphate of iron and lime treatment, consumed about 55,000 tons of lime per year. He believed this could be increased to 250,000 tons—he thought 30 to 40 per cent of the water purification plants of this country could use lime advantageously. He then explained in some detail the chemistry of the process and the advantages of the treated water.

Lime in Agriculture

Dr. MacIntire has been carrying on research work for the lime association for some time. He prefaced his remarks by stating that he saw no cause for antagonism between producers of lime and pulverized limestone; he said he would like to preach a sermon on "Brethren should dwell together in peace and unity."

Dr. MacIntire said that he was just beginning to learn something about the influence of lime on soil micro-organisms, and the consequent effect of lime on soil

fertility. He spoke of the very great value of soil research, and how the work he is doing has exploded some long-cherished theories about the use of lime.

Lime Plasticity

Mr. Emley gave a demonstration of his plasticimeter. He said a finishing hydrate would test around 200 on this machine. He has tested several samples of high calcium finishing lime and proved once and for all that the old theory of the magnesium content causing plasticity does not hold.

The plasticimeter has also been used to measure the qualities of plastering sand and in a way to test the real effect of the addition of hydrated lime to concrete, in other words to demonstrate the difference between "wetness" and "fatness" in wet concrete.

Luncheon Talks

Dr. S. W. Stratton, director of the U. S. Bureau of Standards, Washington, D. C., was the guest and speaker at the Association luncheon on June 15. Dr. Stratton spoke on "Standardization — Government Research and Industrial Development," emphasizing the need of co-operation between the industries and the government. He gave various instances of valuable discoveries that had grown out of the researches of the Bureau of Standards on mere details of manufacture. His conclusions were that there was need to know much more about the nature of materials, and more particularly of lime.

Following Dr. Stratton's talk, William C. Carson, past-president of the Association, paid the speaker a glowing tribute, quoting an interview with the late Theodore Roosevelt, when he was president, to the effect that Dr. Stratton was doing more for the lasting benefit of his country than any president had done or could do—a recognition of research work that Mr. Carson thought should be made known to every one.

The address of Dr. Arthur D. Little, president of Arthur D. Little & Co., consulting industrial chemists, Cambridge, Mass., also emphasized the dependence of modern industry on chemical research. Dr. Little said that limestone, from the chemists' point of view, was an ore of the metal calcium. To add to the interest in this, he passed round a sample of metallic calcium.

An address on general business conditions was given by one of the vice-presidents of the Guaranty Trust Co., W. A. Booth. The substance of Mr. Booth's remarks was that our industrial and business outlook is inseparably linked up with European conditions, but that on the whole there was every reason for optimism.

Association Staff and Its Accomplishments

The better part of one session was devoted to short talks by L. H. Hart, manager of the construction department of the National Lime Association; Dr. M. E. Holmes, manager of the chemical department; J. A. Slipher, assistant manager of the agricultural department; Henry M. Camp, director of the Eastern Bureau of the National Lime Association; T. B. Shertzer, field engineer of the Eastern Bureau; R. C. Parker, agronomist of the Eastern Bureau; C. O. Dowdell, field engineer of the Central Bureau, St. Louis, Mo.; and H. L. Brickell, field representative of the National Association.

Some of the activities of the construction department touched on by Mr. Hart were: Specifications, mailing lists, construction news bulletins, own your home show exhibits, proposed advertising campaign, quick setting lime plaster, investigation of unsound lime plaster, plasticity of concrete, wetness vs. fatness of concrete, effect of hydrated lime on the strength of concrete, building code revisions, fire protection and lime plaster, acoustics of plaster walls, colored plaster, glazed surfaces of plaster, estimating plaster work on standardized forms, lime stucco, etc.

Dr. Holmes told of the extensive preliminary work done in building up contacts between his department and other laboratories engaged in research work, of co-operation with universities, lectures to chemical and engineering students, and the establishment of research fellowships. He said the lime Association would have an exhibit at the Chemical Show in New York in September.

Mr. Slipher said his department was endeavoring to do fundamental educational work in the agricultural use of lime. He is endeavoring to furnish undisputable facts, based on scientific investigation, to state agricultural officials, he is not trying to reach the farmer direct, he said. He has done some important educational work with high school students. He said some progress had been made toward a uniform agricultural lime law in the various states.

Mr. Camp told of the intensive field work done by the Eastern Bureau, a description of which will appear in a later issue. Mr. Shertzer gave a very interesting illustrated lecture on lime stucco and lime plaster, giving some idea of its ancient and honorable lineage.

Altogether it was certainly evident that the lime industry now has a staff of remarkably alert and able men working in its interests.

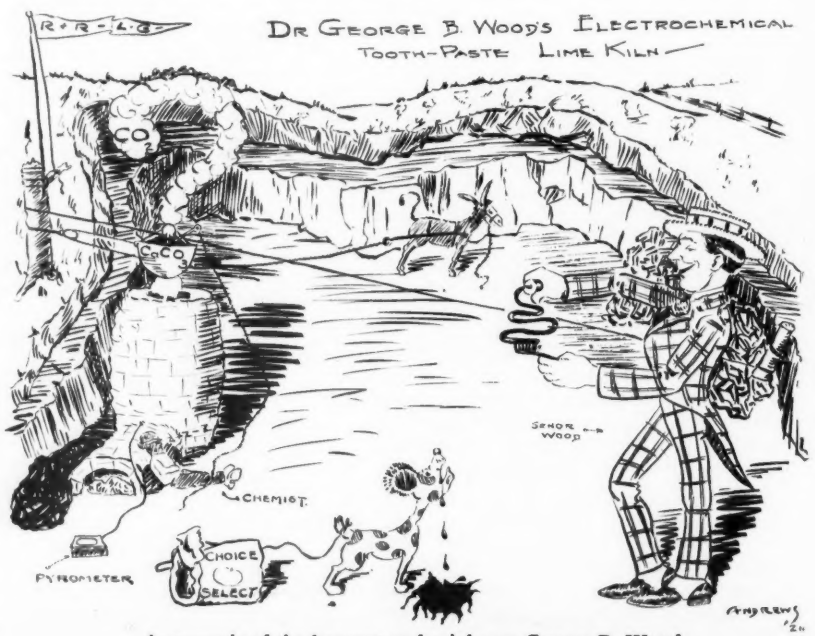
Old Officers Re-Elected

Charles Warner, president of the Charles Warner Co., Wilmington, Del., was re-elected president; George J. Nicholson, of the White Marble Lime Co., Manistique, Mich., was re-elected vice-president and A. H. Lauman, president of the National Mortar and Supply Co., Pittsburgh, Penn., was re-elected treasurer.

The same dues as those now current, were voted for 1921, based on the 1920 tonnage, which was considerably larger than the 1919 tonnage, so that the association work will go ahead on an enlarged scale. The association ended its fiscal year with a substantial bank balance and is in excellent financial condition.

The Wet-Mortar Business

LIME MEN! Don't fail to read the paper by W. C. Hay on the wet-mortar business, to be published in the next issue of Rock Products. Mr. Hay's talk was as refreshing as it was instructive.



A souvenir of the banquet and a joke on George B. Wood

Problems in Changing a Quarry from Hand to Steam-Shovel*

With Particular Application to the Lime Manufacturer

By Irving Warner
Charles Warner Co., Wilmington, Del.

DURING the extremely difficult operating period of the war and immediately thereafter many a quarry operator turned his attention to the question of eliminating hand work and substituting the steam shovel. Now that the pressure of labor shortage is removed, many operators are no longer considering this expense, although others realize that sooner or later the laborious work of sledging and loading stone must give way to machine methods.

The purpose of this paper is to discuss the various local conditions and their effect upon the choice of proper equipment. The particular problems may be summarized as follows:

1—The quarry.
   a. Nature of the stone.
   b. Height of the quarry face.
2—Size and type of shovel.
3—Transportation system.
4—Crusher.
5—Special problems of the lime manufacturer.

Each of these items must be taken in its relationship to the others, and at best any solution is a compromise.

The Quarry

The nature of the stone has a most important effect upon the size of the crusher. A strong-bodied stone of high crushing strength and few cross fractures requires a crusher with a larger opening than a softer, more friable rock, irrespective of the size of shovel and cars. In fact, this question of the strength of the rock may be the determining factor in the selection of a crusher of sufficient size.

Near Bellevue, Ohio, the France Stone Co. has a deposit of stone which is quite filled with cross fractures. This stone blasts down easily and is handled by a railway type steam shovel with a dipper of about 2½- or 3-yd. size. This material is dumped into a No. 9 gyratory crusher and requires very little hand feeding. This plant affords an extreme example of the satisfactory combination of a large shovel and small crusher, which is possible through the nature of the rock. A No. 9 crusher has an opening between the head and concaves 18 in. wide.

At the plant of the Charles Warner Co. at Cedar Hollow, Pa., a reverse condition has been experienced. Some of this rock has very high crushing strength and blasts out in large diamond shape pieces. At this plant ¾-yd. traction shovels are used, yet it was quite easy to handle pieces which will arch and choke in a jaw crusher having a 48x60-in. opening.

No one should consider changing over his quarry from hand methods to steam shovel without making a thorough examination of the practice and equipment at various plants. And when such a survey is made it is necessary to give most careful attention to the character of the rock in the quarry where the changes are contemplated. It is one of the most important phases of successful installations, and is the one most likely to be overlooked.

Height of Quarry Face

The height of the quarry face has a bearing more on the methods of quarrying employed rather than on the equipment of shovels and crusher. It does have an effect upon the proper drilling equipment.

A face of less than 40 ft. is preferable for any size of shovel. A certain standard practice has been developed in the large fluxing stone quarries between New Castle, Pa., and Youngstown, Ohio. These quarries are all operating on horizontal strata. In some cases the height of the face will be 15 ft., in a few cases as low as 7 ft., and sometimes as high as 22 ft. The shovels used are the railway type, handling dippers of from 2½- to 4-yds. capacity. Drilling is done on the top and at such distance back from the face that these large shovels can clean up the entire shot on one passage. Since the quarry face is of a uniform curvature, the development of the quarry consists of a gradual spiraling cut which brings a very high efficiency of operation.

In higher faces, or with the use of smaller shovels, it becomes necessary to make two or more trips past the front of the blast in order to make a complete clean-up of the loose rock. There are some objections to this system, as it is apt to make the production of the shovel inconsistent. In some cases the shovel will produce more on the first trip when working on loose stone, and in other cases it will make better time on the latter trips, when it has a greater body of stone to work against. Difficulties in this connection can often be overcome by proper quarry management. By blasting against a shot that is already out it is often possible to maintain a loose condition of rock, which facilitates the work of the shovel and at the same time maintain a considerable depth of broken rock so that the shovel always has plenty of material to work upon.

The higher the face, the greater is the tendency for the stone to come out insufficiently shattered. This becomes a very serious problem with stone that has a natural tendency to come out in large pieces. Therefore it is not desirable to drill the holes back at a considerable distance from the front as this condition would thereby be aggravated.

This problem has been appreciated at one of the quarrying operations near Youngstown, Ohio, where the churn drill has been abandoned and rows of tripod drill holes are put down from on top. More frequent spacing of these smaller holes results in a more thorough breaking up in the primary blast, largely obviating delays for block holing.

Steam Shovels

Undoubtedly the best size and type of steam shovel for quarrying purposes is the railway shovel running on a track and mounted on eight wheels, with a dipper capacity of about 3 yds. These shovels are rugged, of a standard type and should be used if other conditions around the plant permit.

Such a shovel with good quarry management can deliver from 1200 to 1500 tons of stone a day. Accordingly it would scarcely be wise to use a shovel of this size unless at least 800 tons daily were desired. It might also be undesirable to have a plant entirely dependent upon one shovel for its supply of stone provided there were no facilities for storage. This would be a question that every operator would have to settle for himself, namely, whether he would be willing to take the chances of being tied up through the breaking down of a single shovel or whether he would take the increased operating costs of having an extra shovel or by using smaller equipment.

*Paper read at the annual convention of the National Lime Association at New York City, June 15, 1921.

It scarcely pays to use a railroad shovel of less than 2½-yds. capacity. With the smaller sizes, the shovel becomes slow in moving heavy stuff and is not flexible enough to get out of the way for heavy shooting. In addition the cost of laying the tracks for the shovel and for the paralleling line of industrial track would be no greater for the big shovel than it would be for a smaller one.

Smaller shovels have been used only to a comparatively limited extent in quarries. Yet in the few installations there seems to be a consensus of opinion to step down to shovels of the traction type of 1-yd. capacity or less.

It is not usually feasible to use a shovel on traction wheels of a size greater than 1 yd. In some quarries this has been done where there is very little dirt in the stone so that the quarry floor offers a very good roadway for a heavier shovel. The ¾-yd. shovel on traction wheels will weigh approximately 20 tons, and in general this is heavy enough load on any ordinary quarry floor.

Under good local conditions a ¾-yd. shovel can do about 300 tons daily. A crew of two men is sufficient unless the quarry floor is irregular.

Well-built small shovels can handle stone larger than a 48x60-in. jaw crusher can receive so that in general no problem of additional block holing is introduced through the use of these smaller machines The objection to their use lies in the fact that in heavy work they become quite slow, comparatively more so than a heavier shovel.

Small shovels on traction wheels offer attractive possibilities to a quarry operator under the following local conditions:

1—A small tonnage, say, less than 800 tons per day.

2—Where it is desired to split up the tonnage into smaller units either for reliability of stone supply or because of the nature of the rock that must be taken out from the different points in the quarry.

3—When an industrial system is of light weight which would prohibit the use of a heavy shovel.

4—When the conformation of the quarry prohibits the rounding out of the quarry in a curve, preventing a railway shovel being advantageously employed.

5—Where the floor is firm so as to give good roadway for a shovel on traction wheels.

From the present outlook there would appear to be no field between the small traction shovels and the large railway shovels. Therefore, the investigator is practically limited to these two extremes of installation. With the perfecting and cheapening of the caterpillar tread there may be a future for the full revolving shovel of about 1½-yd. capacity. It is to be noted, however, that a full revolving shovel of large size must necessarily be sluggish as compared with the railway type shovel which moves only its boom.

Transportation Systems

The following points regarding a transportation system must be taken into consideration.

1—Relative size of car and shovel.

2—Size of the unit of train movement.

3—Relative size of car and crusher.

When using heavy railway type shovels the gauge of the industrial track should be not less than 42 in. and standard gauge of 4 ft. 8¼ in. is preferable. With standard gauge it is possible to use a heavy, well-designed car that will hold as much as 15 tons, which is very instrumental in rapid operation.

A point not usually considered is that a high car is cheaper to load into than a low car, and that high cars may more safely be used on a wide gauge track than upon a narrow gauge one. The economy in loading high cars is due to the fact that when it completes its working stroke the shovel usually has its dipper well in the air. This allows the runner to drop his load without the necessity of lowering the dipper down to the car.

By the use of as large a car as possible, much time is saved on the shovel in the actual spotting of the dipper and through rapid dumping from a greater height. The large, heavy car on standard gauge can stand punishment of this kind which would be impossible with lighter cars. Also the spill will be much less.

The size of the unit of train movement is not always given the consideration which it deserves. For good practice the train load of stone handled on one movement should equal at least 20 minutes of the nominal capacity of the shovel. As for example, a railway shovel with a nominal daily capacity of 1200 tons equals 120 tons per hour equals 2 tons per minute, should be served by a train carrying 40 tons of stone. In practice, with a daily average of 1200 tons, this 40-ton train should be filled in from 10 to 15 minutes' time and the balance is lost time in moving the shovel, shifting trains, etc.

Corresponding figures with a small traction shovel would be 300 tons per day, equals ½ ton per minute, requiring a train of at least 10 tons' capacity.

In these figures may be noted one of the fundamental reasons why the small shovel can compete with the large one. Very few operators of railway shovels will serve them with a 40-ton capacity train. The operator of a small shovel has no difficulty in serving it with trains of 10 to 15 tons' capacity each. In fact, with a specially designed car, the Cedar Hollow plant of the Charles Warner Co. has succeeded in making train units of 21 tons. This was accomplished on a track of 24-in. gauge, which is altogether too narrow even for shovels as small as ¾-yd.

Even a ¾-yd. shovel is preferably served by a track of 36-in. gauge in order to get sufficiently large train units and a high car that can be loaded more economically. The new type of car at the Cedar Hollow plant, above mentioned, operates satisfactorily on 24-in. gauge and averages a 3½-ton load. But to secure stability on 24-in. gauge it is of necessity quite low, which slows up the shovel slightly. Aside from this it is a very satisfactory car.

Quarry Cars

The relative size of the car and the crusher is of utmost importance, and one most frequently overlooked. A large car demands a large crusher, all other conditions being equal. If the car is of such small size that its load will not fill and cover over the top of the crusher, then obviously there is much less opportunity of jamming and arching.

This condition is much helped by having a considerable length of chute between the point of dumping the car and the mouth of the crusher. This thins out the load and causes the large stone to go in endwise, thereby permitting the use of a larger car than would otherwise be possible. An apron feeder or similar device will accomplish the same purpose.

It would be well to reiterate here the important factors that have bearing upon the proper size of the crusher. We constantly hear discussed the relative size of shovel and crusher as if this relationship were the only or the most important point. But the most important considerations of determining the size of the crusher are the nature of the rock itself and the size of the car. The size of the shovel, also, has an important bearing, but certainly less than the others.

Steam-shovel service is exceedingly hard on cars. Any car of the "contractor type" or the rocker dump type will not be durable when used with steam shovels. It is necessary to have a type of car in which a considerable portion of the bottom is flat and resting directly upon a heavy decking on the truck. Otherwise the dropping of stone will be constantly knocking the body out of shape. This type of car requires a power dumping device at the crusher. Spring journal boxes help in saving a car from rough treatment.

It might be well to say one word regarding the use of the motor truck for transportation from shovel to crusher. At least one company is trying this out with reputed success, but no cost figures are available. Undoubtedly under conditions of a short haul and good roadbed, the motor truck may become popular when used with smaller shovels. But it would appear safer for the average operator to stick to well-tried and economical industrial railways rather than experiment with the high-priced and rapidly depreciating motor truck. The time will come when 3-ton dump trucks can be purchased for $1800 or less, and then a new era will be

opened for the quarry operator. In the meantime he will do well to adhere to accepted practice.

The Crusher

In most installations the crusher is selected for the size of its opening rather than for its capacity. Since the jaw crusher has a large mouth opening for its cost and output it is usually selected for all installations of lime plants. The order of importance of different items which go to determine the size of the crusher is approximately as follows:

1—Nature of the stone.
2—Size of the car.
3—Size of the shovel.

The effect of all of these has been elaborated above, but it would be well to inject a word of caution at this point. Experience has shown that most installations have crushers which are too small for their purpose. Quarry operators install large shovels to secure economy at the quarry face, probably skimp a little bit on the size and type of car and end up with a crusher which is very much too small. The easiest thing to change in a quarry is the size or type of the shovel. Usually the most difficult thing to change is the crusher itself on account of lack of head room, necessity of additional foundations and larger conveying and elevating machinery. Therefore it would appear to be better to put the money into the crusher, and if skimping must be done, skimp on the shovel and the rolling stock. Many good installations have been seriously hampered by delays at the crusher.

The largest size jaw crusher that can be shipped and erected with a one-piece frame is the 48x60-in. One size larger than this must be shipped knocked down on account of railroad limitations. As a result this size crusher is now being frequently installed. It is being successfully fed by shovels of various sizes running from a ¾-yd. traction shovel at Cedar Hollow plant of the Charles Warner Co. up to 3-yd. railway shovels at the plant of the Security Cement & Lime Co., and at some of the Ohio lime manufacturing plants. This crusher is not quite large enough for this work. But it has been the economic limit for these plants on account of the excessive cost involved in the purchase and installation of the larger sectional frame crusher. There is occasional difficulty at all the plants using this crusher which is usually due to the nature of the rock, or failure to supply a sufficiently long chute from the car dumping point to the crusher mouth.

Other plants have installed crushers of size 42x48-in. and 40x42-in. This has been an unfortunate economy since almost any shovel or any naturally hard-bodied rock will cause considerable jamming and arching with these smaller size crushers.

The gyratory crusher should only be considered where enormous capacity is desired, say 4000 tons per day or more.

Special Problems of Lime Manufacture

The producer of fluxing stone or the manufacturer of cement may possibly more advantageously use a gyratory crusher on account of the larger capacity required and because of the size to which the stone is ultimately reduced. The lime manufacturer using vertical kilns has a different problem. He wants a maximum percentage of "one-man stone." A jaw crusher is the best machine to give this product as it will let slabby stone through which is not objectionable to the lime manufacturer. It will also make a maximum percentage of big stone and can advantageously be set with a wide jaw opening.

This very fact, however, brings about additional difficulties when preparing stone for vertical kilns. The individual pieces of stone are so much larger than is customary in normal crusher practice that new problems are introduced in the conveying, elevating, screening and subsequent handling of the material.

Larger and heavier units are needed throughout the system than would be justified by the mere question of tonnage handled. The crusher itself is set with a wider opening so that it usually operates much above its rated capacity and this condition prevails to such a marked extent that it can only be partially alleviated by slowing down the crusher. Ordinary good practice may be followed throughout the balance of the crusher plant but it is necessary that all the units be from 50 to 100 per cent larger than ordinary practice would dictate.

There is no objection to the rotary screen for screening out the "one-man stone" for vertical kilns. Various devices have been proposed and installed in anticipation of the unsuitability of the rotary screen. This is a mistake, as rotary screens are still the best machines for this preliminary screening. It is well, however, to make certain detail changes from orthodox practice. The scalping screen for removing the one-man stone should be large in diameter, very short and placed at a comparatively steep angle. Its rotative speed should be slow. For example the screen of the Cedar Hollow plant of the Charles Warner Co. is an open-end type, 6 ft. in diameter, 12 ft. long, of which 2 ft. is blanked off, leaving only 10 ft. of actual screening length. Its inclination is 2 in. to the foot and it rotates at 12 r. p. m. Although these details are rather abnormal from the crushing man's viewpoint, nevertheless greater satisfaction could be gotten by having the screen shorter, steeper and of slower rotation.

One-man stone tumbling around inside of a rotary screen is very severe service upon the screen and is hard on the stone itself. Therefore the purpose of using a short, steep, slowly-rotating screen is solely for the reduction of wear and tear. With the large openings that are used when making one-man size of stone, say 5 or 6-in. round holes, the capacity of such a screen is enormous so that the main object of the installation should be to economize in operating costs and reduce the breakage of excessive tumbling of stone. Therefore very short, steeply-inclined screens are satisfactory.

The subsequent sizing screen may follow normal crusher practice.

For the lime manufacturer the handling of one-man stone from the bin may of itself become a serious problem. This is largely dependent upon the size of the one-man stone desired as well as the nature of the rock itself. If there is little use for the smaller sizes of stone, then the operator aims to make the highest percentage possible of one-man stone. This requires a coarse setting of the crusher so that the one-man stone will run as large as possible without interfering with successful burning in the vertical kilns. If coupled with this, the stone is strong-bodied, then there is a great deal of difficulty in getting stone out of the bin.

Many installations, on account of the nature of the rock and the size of one-man stone desired, have little difficulty in handling this stone out of bins through ordinary large-size gates or chutes. But others with strong-bodied stone and large pieces cannot handle the stone in this way and must resort to special mechanical devices for feeding the stone out of the bin.

This is an important phase of the problem that the investigator must not overlook. By careful comparison of the nature of the different rocks, and the size desired, he can determine whether he will need a mechanical device or not. At least in the design and construction of the bins, sufficient space and headroom should be provided so that the subsequent feeding out device may be installed if necessary.

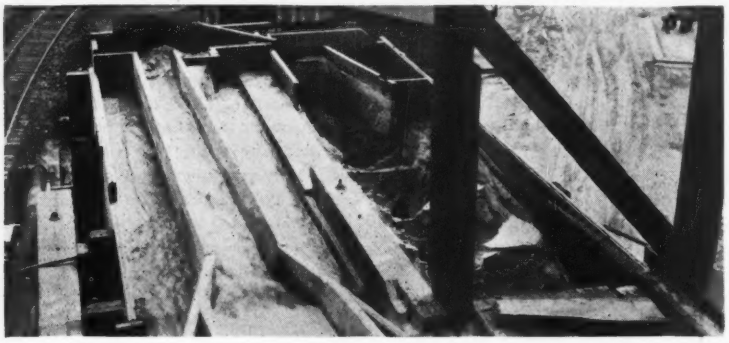
Summary

From a broad viewpoint, sooner or later all stone will be produced by machine methods except in the small operations. Irrespective of the minor peaks and valleys of labor supply, the universal tendency is to substitute the machine for laborious manual work. At the present time the shovel and crusher cannot compete with handwork for small tonnages. Even in moderate tonnages savings are small and the advantages to be gained are largely contingent. The shovel and crusher installation is less subject to loss of output on account of rainy weather or because of excessive heat in summer time. It also places the proper preparation of stone more definitely in the owner's hands than is possible when stone is prepared by handwork. These advantages will usually justify a shovel-crusher installation.

Hints and Helps for Superintendents

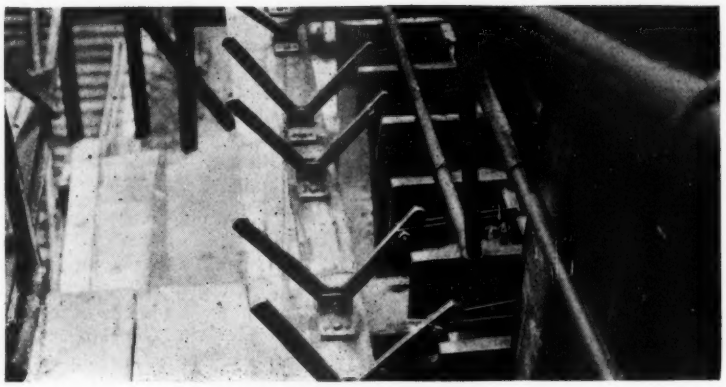
Two-Compartment Sand-Settling Tank

THE views presented herewith show a two-compartment sand-settling tank in use at the plant of the Wolf River Sand Co., Memphis, Tenn. In the operation at this plant the ¼-in. to 3/16-in. material goes to an automatic sand separator while the 3/16-in. material and under is flumed off into the sand-settling tanks. The flume is so constructed that the material may be directed to one compartment of the tank or the other. This is accomplished by a gate in the flume that deflects the flow into the compartment desired. In this way the settling tanks are worked alternately; that is, while one of the tanks is being filled the other tank is being drained.



Settling tanks and flumes

The settling tanks are fitted with gates on the bottom. When a tank has become full it is drained by opening these gates, operated by the levers illustrated in one of the accompanying photographs. The waste water from either tank is flumed back to the pond. J. H. Griffith is superintendent and T. J. Billingsly, assistant superintendent.

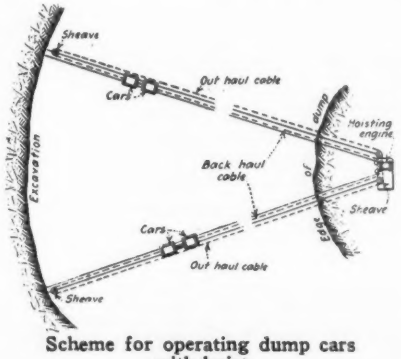


Discharge levers for settling tanks

Cable Haulage for Dump Cars

A SCHEME for operating dump cars between the excavation and the spoil bank is described in a recent issue of Engineering News-Record. This scheme might be used in some instances in handling the stripping of quarries or gravel banks, and possibly for handling stone or gravel in some small pit operations. The method of operation is described as follows:

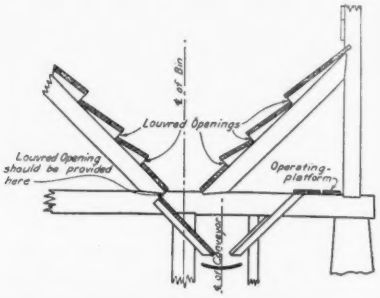
"In distributing about 7,000 cu. yd. of excavated material with a haul of only a few hundred feet a cable system with dump cars was installed to eliminate the use of teams. Two 24-in. tracks were laid from the excavation to converge at a hoisting engine, the tracks serving a triangular area about 250 ft. wide and 300 ft. long. On each track were two 1½-yd. dump cars coupled together. A ¼-in. cable led from the head of one car to a drum on the engine. From the rear end of the other car a similar cable was led to a block hitched to a deadman at the excavation end of the track and then back to another drum on the engine. The engine remained in position for the entire work, but the tracks were shifted to suit the loading and dumping operations. This plan is credited to J. M. Egan, Jr., Elgin Construction Co., Aurora, Ill."



Scheme for operating dump cars with hoist

Improved Louvred Bin

AN IMPROVEMENT to the louvred bin, described in ROCK PRODUCTS, April 9, 1921, page 32, is suggested by Newton L. Hall, Salt Lake City, Utah, in the April 30 issue of the "Mining and Scientific Press." Mr. Hall says:



"If it is desired to carry the discharge of the bin to a conveyor-belt situated on one side of the center line of the bin, this can be done to better advantage by providing another louvre opening in the bottom, as indicated in the sketch. To continue the bottom of the bin without a break is to disregard the louvre principle at a place where the congestion of the load is greatest and where relief is most required.

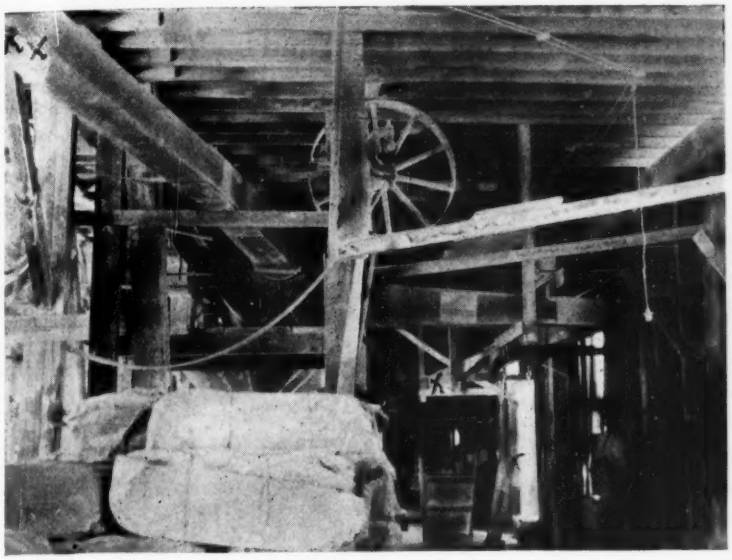
"An important advantage secured by placing the conveyor belt to one side of the center line is that a single rather than a double row of columns can be used for supporting the horizontal beams."

Ventilating the Packing Room

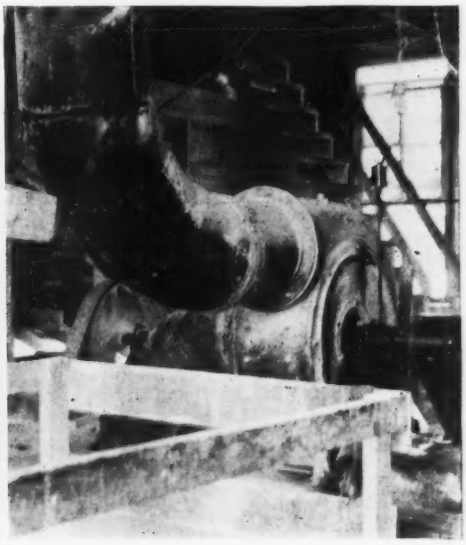
TO PROPERLY ventilate the packing room in a lime, cement or gypsum plant is always a troublesome matter. Especially is this true in a warm country, where the dust combined with the hot weather makes conditions unbearable for the men employed at the bagging machines. The Dittlinger Lime Co., New Braunfels, Tex., has solved this problem to their entire satisfaction.

In the views accompanying this article a portion of the packing room of the Dittlinger Lime Co. is illustrated. The incoming air trunk is marked XX. This is near the intake, which is out under an overhanging roof where reasonably cool air, free from dust, may be obtained. This air is blown to the men at the bagging machine beyond the fan through the trunk marked X. This gives the men good air, free from dust, and cools them considerably during the hot weather.

A suction fan is also employed to draw the dust away from the bagging machine. This relieves the dust problem considerably and also reclaims a good amount of lime. The system explained has been a good means to keep men employed at the bagging machines during the extremely hot weather. J. A. Ogden is vice-president and general manager of the company.



Ventilating system in packing room—xx shows air trunk intake; x shows air trunk exhaust



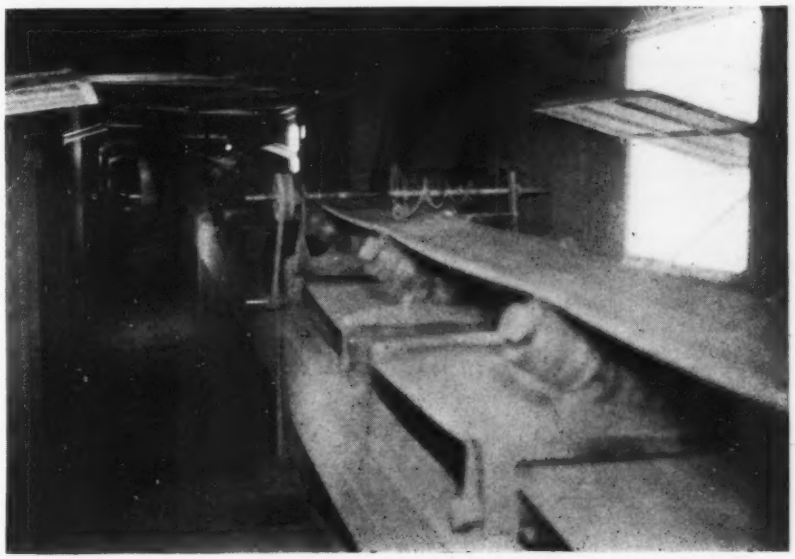
Exhaust fan used to draw Lme dust away from bagging machine

Device for Sampling Finished Cement

AN INGENIOUS DEVICE for obtaining a continuous sample of finished cement is illustrated in the accompanying photograph. This device is in use at the new plant of the Oklahoma Portland Cement Co., Ada, Okla. It consists of a spiral hollow tube, which is attached to a small shaft, belt-driven from one of the return idler pulleys of the belt conveyor. The finished cement is distributed on this belt conveyor for transfer to the finished cement storage.

On leaving the compeb mills the cement goes direct to an air separator which is installed in combination with the compeb mills. The fine particles from the air separator are discharged into a screw conveyor, feeding a bucket elevator, from which the final product is elevated and discharged on the belt conveyor to which the cement sampling machine is attached. The compeb mills are so arranged at this plant that they can work with or without the air separators.

The revolving spiral hollow tube has a lip on the end that picks up the cement from the center of the belt conveyor and as it revolves the cement is cascaded through the spiral and discharged through the other end into a vertical pipe that extends down to the burning platform. Underneath this pipe is the sampling box that is changed every hour by one of the laboratory boys. In this manner the chemist is afforded the opportunity of getting a fair sample of the finished cement, as it goes to the stock house, every hour. M. O. Mathews is manager; R. C. Rodarmel, superintendent, and O. A. Bayless is chief chemist.



A finished cement sampling machine

Sand Settling and Sand-Settling Devices

No. 3—Types of Settlers—Whole Current, Surface Current and Launder Settler

By Edmund Shaw
Allen Cone Co., El Paso, Tex.

ALL forms of settling apparatus have three things in common, a way of admitting the feed, a way of taking off an overflow, and a way of disposing of the settled product.

There are few variations possible in the way of admitting the feed and taking off the overflow, but a great many ways of disposing of the settled product are in use. With the simplest forms of settlers, such as settling boxes and catch basins, the settled product is removed by shoveling or by sluicing out with a hose. Where the tonnage to be handled is large, some form of excavating apparatus is employed in combination with a boom derrick or a locomotive crane. In other forms the discharge is by gravity, the settled sands being allowed to run out of an opening in the bottom as a quicksand or thick mud. And in more elaborate devices the sand is removed continuously by screws, drags or flight conveyors.

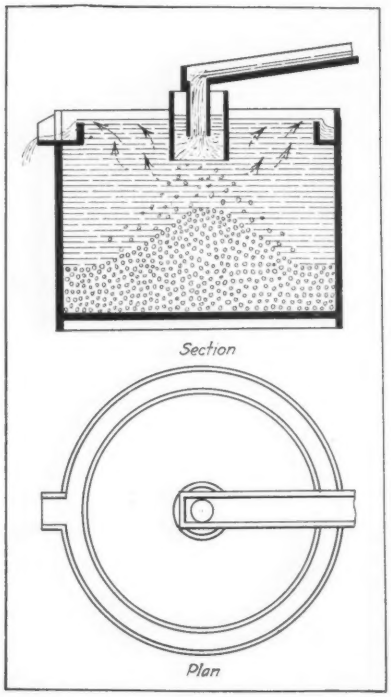


Fig. 1—Typical whole current settler

Aside from variations in the manner of disposing of the settled product, we may divide all settlers into a few classes from the way in which the laws of settling are applied. By far the greater number of settlers fall into two of these classes, and are described as whole current settlers and surface current settlers.

Whole Current Settler

Fig. 1 shows a whole current settler. The main body of the device in this case is a round tank, although it may be of any shape. In the center is a short pipe, called the feed spout, or inlet spout, through which the sand and water enters. The feed stream spreads out after entering the tank, and in doing so it loses its velocity, and hence the power to carry the sand. Hence the sand falls to the bottom of the tank while the water rises as a slow upward current throughout the whole tank and then passes to the rim overflow, from which it is drained away by the overflow spout shown in the diagram.

In No. 1 of this series of articles we showed how to figure the size of a simple settler of the whole current type so that it would settle all the sand coarser than 100-mesh from a stream of 1,000 g. p. m. Using the table of falling rates in the manner described, it is an easy matter to figure such a settler for any desired size of grain and quantity of feed.

Surface Current Settler

Fig. 2 illustrates a surface current settler. The feed instead of being passed down an inlet spout is spread out over the surface of a broad, flat launder, or apron, called the "feed sole." This feed sole is set at 5 or 10 degrees from the horizontal to give the water momentum to carry it across the settler. With this momentum the feed flows as a thin flat current across the top of the settler over a pool of still water that fills the settler. The overflow is taken off at the opposite end of the settler to that at which the feed is admitted.

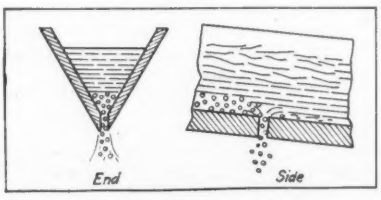


Fig. 3—Launder classification

In the whole current settler previously described we have two opposing forces, the velocity of the rising current, which tends to lift the sand and, gravity, which tends to pull it down. In the surface current settler two forces act at right angles to one another; the velocity of the stream tending to carry the sand in a horizontal direction, while gravity tends to pull it down in a vertical direction.

Proportion of Width to Length

This fact introduces another element in the calculation of the size of settler required to settle any given size of grain. This element is the proportion of width to length. The velocity of the incoming feed stream is reduced by spreading it out, so that it will be wider. But gravity is constantly acting on the grains, and in a long settler a grain may have time to fall through the surface current and into the still water below, whereas it might be carried over and out of a shorter settler, because the time given was not sufficient for it to fall appreciably.

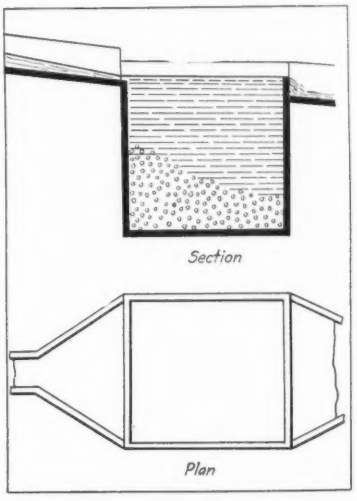


Fig. 2—Surface current settler

Very long surface current settlers are excellent for making a separation into two sizes of sand. At one time they were more in use than at present, but owing to the difficulty of recovering the sand

when it is spread out through such a length, the high first cost and the space occupied, they have been superseded by more convenient and cheaper forms.

No table of mesh sizes and settling rates can be given to apply to surface current settlers as these tables are applied to whole current settlers. Tables of widths for a certain length have been figured out for water flows and grain sizes, but the writer's experience in designing from one such table which has been published was not very satisfactory. The matter of designing surface current settlers will be discussed when the forms of such settlers are considered.

Launder Settlers

A form of settler which belongs to neither of the two classes described is called here a "launder settler," for want of a better name. It is shown in Fig. 3. Everyone knows that sand carried in a launder (or sluice) tends to drag along the bottom. This is especially true in launders having a V-section. By making a small hole in the launder, in the apex of the V we may obtain a flow containing most of the solids with comparatively little water. The excess water will flow on by the hole and be discharged at the end of the launder.

This is a rather crude method of settling but it has its uses, one of which is to procure a partially de-watered product to be handled in more efficient forms of settling and separating devices.

"Buddling" is allowing the feed of sand and water to flow in a thin sheet, or film, over a bed of sand. The grains carried by this thin current are caught and held by the depressions in the sandbed. This method once had considerable use in concentrating plants. It is mentioned here only because it is employed in a form of sand collector to be described later.

The falling rate machine is really more of a laboratory device than a commercial machine, but at least one commercial machine has been built upon the principle that it employs. To understand its principle we may imagine a vertical tube moving slowly through a tank of water. If grains of sand were fed into the tube they would fall along the track of the bottom of the tube, the heaviest grains first and so on to the lightest. Now suppose a continuous series of such tubes continuously fed. A constant product could be taken off at any point in the track.

(To be continued)

Phosphate Mines in Dutch West Indies

THE phosphate mines at Newport, Curacao, according to the consular reports, exported 10,058 tons valued at $70,406 for 1919, and 61,440 tons valued at $717,713 for 1920.

Fall Contract Letting

Associated General Contractors Invite Suggestions on Plan to Cheapen Road Costs

THE following letter from Stanley D. Moore, of the Moore-Young Construction Co., Waterloo, Iowa, Chairman of the Highway Division of the A. G. C., to W. R. Neel, Atlanta, State Highway Engineer of Georgia, and chairman of the Conference Committee of the American Association of State Highway Officials, is self-explanatory. As the subject of fall lettings of highway contracts is extremely important to all contractors in the Highways Division, comment is invited on the matter. Letters should be addressed to Headquarters of the A. G. C., 1038 Munsey Building, Washington, D. C.

The letter reads:

"I have just received from our Executive Board the necessary sanction for the promulgation of a policy that will require your quick and hearty co-operation, if it meets with your approval, together with that of the National Association of Railway Executives, National Coal Ass'n, National Sand and Gravel Producers' Ass'n, and several other associations that are either directly interested in construction projects or are users of open-top railway equipment.

"There has already been some correspondence with individual members of some of these interests.

"Briefly, the idea is to change the custom which is just starting of letting highway contracts in the spring to a general plan of making such awards in September and October, particularly in the northern section of the country. The reasons are, of course, obvious to you, but in order to save your time I will review some of the arguments in support of the proposition.

"1. There has been in the past and will be in the future, to a greatly increased degree, an acute shortage of open-top equipment during the months of September, October and November, these being the three months during which the coal begins to move and being also the peak of the aggregate movement for highway and other large construction projects.

"2. The closing of the contracts in the fall would enable the contractor to perfect his organization and arrange for his storage and unloading during the idle winter months, thus permitting the early movement of aggregate during March, April, May and June before the coal starts.

"3. The same argument applies to the movement of cement in box cars before the grain movement begins, and to new contractors' equipment, the sale, production and shipment of which is now crowded into May, June and July.

"4. Instead of the maintenance of expensive lobbies and committees in Washington trying to get preferential rulings out of the Interstate Commerce Commission and generally quarreling over the car supply, a little co-operation along this line will have the effect of spreading the peak load and fundamentally removing the cause of the trouble. The ramifications of this feature are too many to cover in this short outline.

"5. From a contractor's standpoint, and reflected therefrom directly to the public in decreased cost of roads, it is obvious that any policy that will have a tendency to increase the possible number of days during which he can operate, will enable him to spread his fixed overhead over a greater production. For instance, on jobs where industrial track equipment is used. If the contractor can get enough grading ahead during the late fall and some track placed, there are probably 25 days between March 15 and May 15 on which he could lay concrete, but which would not be dry enough for organized grading operations. There are many road jobs which are truck propositions on which stock piles can be built before the frost goes out of the ground, enabling some operation in the early months that would otherwise be impossible.

"6. To sum up the factors entering into this phase of the problem, it is only necessary to say that the goal of low-priced roads will be reached only by the route of increased production, and anything that is done to increase the output per unit, and spread the production over a longer period of time per year, will result in decreased cost of cement, aggregate, transportation, contactors' and supervising services.

"If this thought appeals to you as it does to me, as being a really constructive move in the direction of solving one of our basic difficulties and well worthy of the associated efforts of everyone involved, I would like to have your suggestions as to how we can go about getting the idea before the necessary authorities in time to get it into partial operation before next year. While the situation will be there for us to work on the year after and for some time to come, it appears as though next summer would be the worst, and something might yet be accomplished this summer without waiting for the winter conventions."

Large Concrete Products Company Reorganizes

ONE of the largest concrete products companies in California, the Merritt Concrete Products Co., Santa Clara, is being reorganized with a capital of $300,000, according to a local newspaper.

The present company, headed by J. C. Merritt, manufactures and sells at the present time more concrete pipe than any similar plant in the state, and in point of actual sales is well in the lead. It was organized nine years ago practically with the birth of the concrete pipe industry, and today operates the most modern factory on the Coast.

Plans for the future include an entirely new plant, the location to be decided upon later, which may possibly be started by the first of the new year. Not only pipe, but various other concrete articles will be manufactured in quantity.

Gravel for Gravel Roads

No. 3—Geology of Sand and Gravel Formations and Why Some Gravels Are Better for Gravel Roads Than Others

ESKER AND KAME GRAVELS.—Eskers are the most peculiar and the commonest of all our gravel banks. They are narrow, steep-sided ridges, sometimes a mile or two in length, but oftener not more than one or two hundred yards. Their crests, which are usually narrow and sharp, stand from 15 to 50 feet above the ground around them. Although some are very crooked, most of them are rather straight and may even look like unfinished and abandoned railway embankments. They were built by streams which poured through the ice sheet, in canyons and tunnels, while it was melting away from the region. The removal of ice walls from both sides of the deposit left it standing above the surrounding country, and let the gravel slide until it came to rest at the angle of repose, which for this material is usually between 30 and 45 degrees.

An esker at Henniker, N. H.

Esker building rivers usually followed the valleys, like the modern streams, because even beneath the ice, water draining out sought the lowest paths. But in some cases eskers run gently up a slope toward a saddle between the hills, through which the river had a temporary discharge. Eskers are so peculiar in form and so numerous, occurring all over the State, that they are almost universally recognized as probable sources of gravel. It is only in the more remote and wooded tracts that some of them may still await discovery.

Eskers vary greatly in composition. In some, cobbles make up the bulk of the deposit; and these are piled loosely together, in "openwork structure." In others there is little but sand, which makes them disappointing as sources of road material. In most cases there is enough gravel to encourage development. Where cobbles are too numerous they may be run through a crusher, or the entire mixture, as it comes out of the bank, may be crushed, greatly improving it, because the broken cobbles are both harder and more angular than the rest of the gravel.

The excavation of an esker is usually quick to disclose the fact that the deposit changes in composition both crosswise and lengthwise. It appears to have been built in successive sectors season by season, near the mouth of the tunnel or canyon, while the volume of the river fluctuated, now sweeping along cobbles and then failing, so that gravel or sand followed. Transverse sections often show coarse gravel overlying fine sand, which may be due to a strengthening of the flooded stream as the last beds were laid down and the retiring ice margin, in mid-summer, passed to a position north of the deposit. Some eskers have a double structure, in section, as if made in two seasons.

Kames are deposits formed where glacial waters heaped up sand and gravel against the ice, so that when the glacier melted away it left mounds, hummocks, or ridges. Eskers, then, are a special variety of kame. Others are so diverse in form as to baffle classification. All are characterized by steep ice contact slopes, possibly, though not necessarily, on all sides. Kames often occur alone as hillocks or short ridges, marking the points where attempts to build eskers were abortive. These also occur in groups, where outflowing rivers wound between crevassed and rotted masses of ice or discharged into shallow pools and lakelets between the ice margin and the hill-

View along an esker, Canaan, N. H.

sides. Because of the torrential character of the streams that built them, and the slumping and sliding of the deposit while it was growing and ice walls were vanishing, kames have a chaotic structure.

Cobbles, gravel, sand and clay occur in pockets, lenses, and streaks, horizontal, inclined, and cross-bedded, with sharp but irregular boundaries. No other class of gravel banks is so unreliable. One can scarcely say how much the next load of gravel from such a pit will differ from the last. And yet kames are so numerous and accessible for roadwork that they are much used. Screening and careful selection of material where the best sizes appear in the face of the bank, although adding to the cost, is often more economical than going farther for a better bank. Like eskers, kames usually occur in valleys; but there are striking exceptions, such as the extensive kame field far up on Ossipee Mountain.

Flat-topped delta south of Hillsboro, N. H., occupying a saddle in the hills and marking the former level of an ice-dammed lake. The present river lies over 300 ft. below this old level

Delta and Washplain Gravel.—Streams which issued from the ice sheet into temporary lakes built many deltas.

In the Connecticut valley, from above Woodsville down to the Massachusetts line, there seems to have been a chain of lakes while the country stood lower than now, and dams of glacial drift or obstructing ledges impounded the waters. Possibly the sea reached far up the Connecticut; but field studies thus far are not conclusive on this point. Into these deep bodies of standing water all the streams tributary to the Connecticut washed sand and gravel, building deltas of which fragments are still preserved. Every town in the valley has its gravel or sandpit of this kind.

The structure of a delta consists of (a) an upper layer of gravelly "topset" beds, usually from three to ten feet thick, according to the size of the delta, (b) a deep mass of inclined, sandy "foreset" beds, formed by successive additions to the slanting delta front, under water, and (c) a thin deposit of silt or clay known as "bottomset" beds, which settled on the lake floor and were ultimately buried by the advance of the delta. From this it is seen, first, that a gravel bank developed in the top of a delta is likely to reach sand at no very great depth, which may be foretold by sinking deep test pits if natural exposures do not show it; and secondly, that the thicker as well as coarser deposit of gravel may be expected near the source of the delta, since the material diminishes in size and passes into sand toward the delta front.

Washplains resemble deltas. They are wide, flat plains built by sluggish glacial rivers beyond the margin of the ice sheet, either in lakes or in estuaries or along the stillwater stretches of streams. They thus include both deposits of delta-like origin and uncompleted floodplains. It is often difficult to tell, without a thorough topographic and geologic study of the district, which is the real origin of the deposit.

What has been said about the thickness or shallowness of the topset gravel beds in deltas applies with equal force to washplains; indeed, these are even more likely to be sandy and thin, because they were spread more widely, by streams flowing on flatter grades. The case mentioned in the introduction should be sufficient warning of this.

Kames and eskers are not only closely associated with washplains, occurring at their iceward margins, but in many places lie buried by washplains, where these have spread forward beyond them.

(To be continued.)

Los Angeles Sand and Gravel Company Has Gold Dust By-Product

GOLD is being panned daily only a few miles from the center of the City of Los Angeles and near the heart of the north residential district. Guy W. Rollins, chief engineer for a rock and gravel company, which operates in the Arroyo Seco, has installed a system of crude sluice boxes, and each day "pans" out a quantity of the precious metal that nets him $20 weekly, according to a local newspaper.

The gold dust is found in the gravel that is dug from the bed of the Arroyo Seco and for years has been left with the crushed gravel to be used in road construction. Mr. Rollins discovered the "pay streak" when he entered the company's employ several months ago and has been panning it since then.

Readers of Rock Products may recall an article on the operations of the Natomas company of California, in which an appreciable amount of gold was recovered as a by-product of a sand and gravel plant.

Large Pittsburgh Gravel Dredge Under Construction

ONE of the largest and most complete sand and gravel dredges in the United States is now in course of construction by the John Eichleay, Jr., Co., at Hays, Pa., for the J. K. Davidson & Bro. Co., Pittsburgh, Pa.

The new dredge, which will be known as the Allegheny, is of all-steel construction and will measure, when ready for service, 164 ft. long, 45 ft. wide, and will have a depth of 7 ft. and 6 in. The displacement of the dredge will be about 900 tons. The machinery and all of the other operations in the dredge will be electrically-operated, the power being furnished by 18 motors, ranging in horsepower from 7½ to 250. The dredge will be operated exclusively in the Allegheny River.

Foundry Sand Discovered in Wisconsin

MOLDERS' SAND, a substance extremely valuable for use in foundries, has been found on the farm of C. F. Cooley, Madison coal dealer, at North Freedom, Wis. The sand appears to be of first quality and is an unusual find as foundries in this state have to have it shipped from New York, where the Albany sand is found, and from other states.

State Geologist W. O. Hotchkiss will make an examination of the sand and verify its quality. The discovery will mean a great saving in freight charges if the bed proves to be of good quality and extensive enough to supply the trade.

Building Material Industries Everywhere Under Fire

Individuals and Associations Accused of Every Crime in the Calendar

NEWSPAPER CLIPPINGS from all over the United States show that the favorite indoor sport at the present time is putting building material producers on the grill before legislative investigating commissions or committees. It would be extremely interesting if some qualified statistician would figure up the sum total daily cost of these investigations to the dear public and compare it with the present profits of the building material producers being investigated.

Buffalo Gravel Corporation

At Buffalo, N. Y., the Lockwood committee of the state legislature has discovered the Buffalo Gravel Corporation, which is a sales organization for some of the principal sand and gravel producers in that city. Since the price of sand and gravel in Buffalo has been about the same as in similar cities, it would seem to the unprejudiced that about the only crime the corporation has committed is the elimination of some unnecessary distributing yards, increasing the efficiency of the distribution system and of the production through co-ordination of the efforts of a number of individual producing companies. It is to be presumed that these efforts have resulted in a good profit to the organizers and owners of the Buffalo Gravel Corporation. Official price charts prepared for the investigating committee are reported and show an increase in price between 1913 and 1921 of 50 cents per cu. yd.—85 cents in 1913 to $1.35 in 1921—surely defensible before any jury of men having any knowledge of conditions in the sand and gravel industry.

Unfortunately the name of the National Association of Sand and Gravel Producers has been wrung into the Buffalo case, with the usual inferences by uninformed newspaper reporters and editors.

The Buffalo investigation has also made a great stir over the prices of gypsum plaster and brick. The local building material dealers' association and the New York State Building Material Association are accused of illegal practices.

Kansas City, Mo.

At Kansas City, Mo., a local investigation of the building industry has involved L. T. Sunderland, president of the Ash Grove Lime and Portland Cement Co., who is also president of the Portland Cement Association, and John Prince, president of the Stewart Sand Co.. the chairman of the Missouri Valley Sand and Gravel Producers Association. Here the alleged practice of the open-price policy appears to be the big bone of contention.

Another thing that seems to "get the goat" of the Kansas City investigators is the allowing of dealers' commissions on cement shipped direct from the producing plant to the job. Regarding this practice Mr. Sunderland is reported to have said that his company "would not sell direct to the consumer, even in carload lots, because we consider the dealer, with warehouse and sales force, essential to the distribution of cement."

Surely this is a succinctly stated fact. The allowance of dealers' commissions on bulk commodities like cement has been a long fought-out issue. Not all producers have accepted the outcome of the issue cordially, either, but the fact remains, as Mr. Sunderland stated, that the dealers are necessary—a necessary evil if you will—but nevertheless a necessary feature of the cement or any other industry.

Agitation for State Cement Plant in Missouri—Confiscation

A legislative investigating committee in Missouri has rendered a report favoring the investment of $2,000,000 of public money in a state Portland cement plant. The committee estimates the State can make cement for $1.50 per bbl.

But that is not all. Two other proposed measures of the Missouri legislature authorize the State to condemn cement plants and operate them and to regulate the price of road-building materials.

One of the measures provides that the State can condemn the property of any cement plant in the State and operate it for its own use in the manufacture of cement for road-building.

The proposed measure to regulate the price of road-building materials provides that the manufacturers of road materials must sell their products to the State through the State Highway Department at a price which will not exceed 10 per cent profit.

Failure to sell cement, sand, gravel, clay, brick, rock or other road-building material on this basis is declared a misdemeanor, subject to a fine of from $500 to $10,000.

As Patrick Henry once said, "If this be Liberty, give me death."

Trade Association Activities and the Government

STATISTICS DISSEMINATED among their members by various organizations of manufacturers and distributors will be closely scrutinized by the government for the purpose of determining whether they violate federal laws relating to open-price agreements, division of territory, etc. Efforts of the Department of Commerce to secure from manufacturers in various lines statistics as to stocks, operations and consumption have recently developed the fact that many manufacturers oppose the plan on the ground that they are getting such information from their organizations, and getting it quicker and in more complete form than could be done by the government.

Methods of handling the situation were discussed by President Harding and his advisors at a recent cabinet meeting and the matter will be taken up by the Department of Justice, which recently made a survey of the matter.

During the war various organizations were encouraged to collect and distribute information of this character with a view of acquainting the various industries with the commodities most needed as well as forming a basis for price-fixing by federal agencies, and all the resources of the government were placed at their disposal for this purpose. Following the end of the war, it was considered desirable to have the practice continued until industry resumed normal operations.

It is now the purpose of the administration to have the Department of Commerce gather such statistics, especially as cases have been reported where organizations were using the information for purposes which might prove to be not in harmony with the law. Cases are now pending before the Supreme Court dealing with this question, and an adverse decision would make necessary the immediate discontinuance of such activities with the result that some industries would be left without any data to guide them. It is for the handling of this contingency that the matter is being taken up by the Department of Commerce at this time, as well as to afford industry a greater co-operation from the Federal Government.

A Lucky Cement Manufacturer

A. Y. Gowen, Vice-President of the Lehigh Company, to Go World Cruising in His New Motor Boat

THE LONG CHERISHED ambition of A. Y. Gowen, vice-president of the Lehigh Portland Cement Co. at Chicago, is about to be attained. He is taking a year out of his business life to make a world cruise in his own cruiser.

Standing out to sea from the Pacific Coast, the first objective will be the islands of the South Seas—lately endeared to every adventurer—where he hopes to put the nose of the "Speejacks" into some undiscovered country that will rival in charm and interest the well-told tales of the Marquesas. Thence to Australia and up through the Philippines to the storied coast of Nippon.

Slipping south through the Straits of Formosa to the Chinese coast, this Yankee yachtsman goes up the Yangtsze-Kiang almost to its source, where only the junk or sampan plies the stream. Then down again to the wild lands of Borneo, Sumatra and Java, penetrating the interior as desire and discretion warrant. Around the foot of India, skirting then the Persian and Arabian coasts, south along Africa to Zanzibar and Mozambique, and north again for a rendezvous in the Mediterranean country to complete the eventful history.

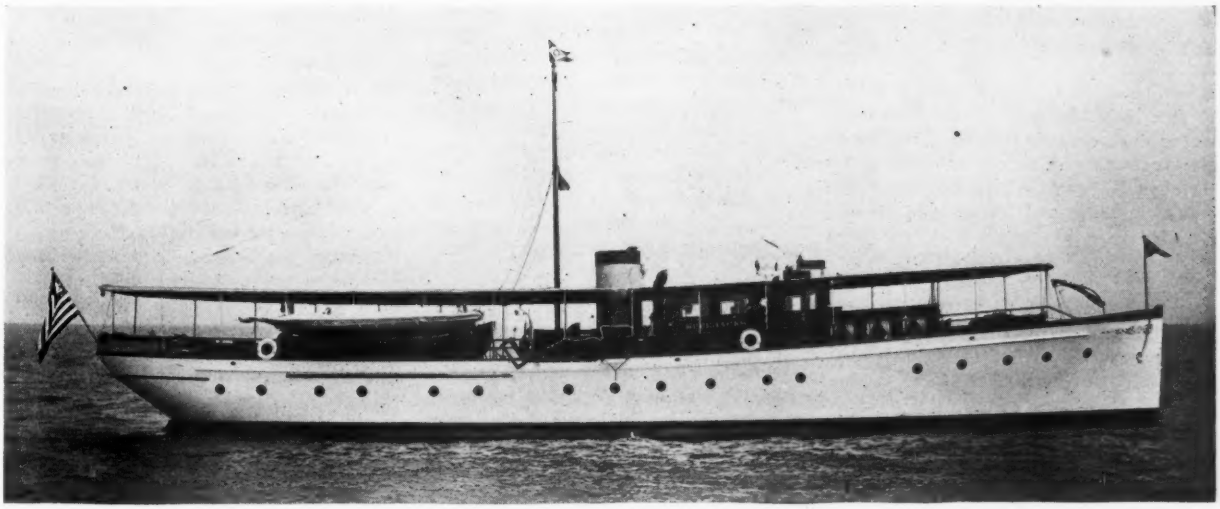
All hands aboard will play their part in the adventure and must accept the risks and rigors along with the thrills and pleasures. Mr. and Mrs. Gowen and their guests will carry on practically all of the ship's business, a crew of six completing the company.

The owner carries aboard a complete motion picture installation and will bring back a permanent pictorial record of the cruise. Besides the infinite variety of peoples and places to be filmed, unusual interest attaches to this feature of the journey inasmuch as it will probably rank as the first of its kind ever attempted under similar conditions.

A. Y. Gowen

From windlass to wireless the design of the "Speejacks" has proceeded entirely under the owner's carefully thought-out plans and embodies every feature essential to such a passage. The "Speejacks" has a length of 98 ft. over all, with a beam of 17 ft. and a draft of 6 ft., and is equipped with two 250-h.p. Winton engines, operated either by gasoline or kerosene, generating a speed of 13 knots, with a cruising radius of about 3,000 miles. Apart from its propulsion, everything on board—such as the operation of the windlass, hoisting and lowering tenders, etc.—is accomplished by electricity, thus reducing the crew requirements to six men instead of ten or twelve. With an eye to any contingency, Mr. Gowen has provided two pieces of every essential apparatus, instead of one, so that in the event of the standard equipment failing to function, he can always fall back on a substitute.

The ship is built to withstand the vicissitudes of every climate. There is a hot-water furnace for cold weather, while for the tropics a system of forced ventilation below decks changes the air automatically every six minutes; wireless telephone and telegraph equipment operate on a working radius of about 1,500 miles, while throughout the ship there is a complete line of inter-communication; a recording instrument known as a sallog and hitherto carried only by ocean liners, registers the speed of the boat in knots and records the various distances traveled; the vibration throughout the boat has been practically eliminated and in seas rough enough to throw the propeller blades out of the water a patented governor holds down their revolutions. Decks and the exterior woodwork are of imported teak wood to withstand all weathers; she carries on deck a sail boat, tender and power life boat equipped for any emergency. This ship will sleep comfortably only seven people besides the crew, for it has been the owner's plan to devote every available inch to deck space. For cruising in shallow waters when the winds are favorable, the boat is equipped with a complete set of sails.



The "Speejacks" in which A. Y. Gowen proposes to cruise around the world

Review of Eastern Markets

BUILDING WORK is growing in the New England districts, and while operations for the most part are of small scope, yet the sum aggregate shows a gradual trend towards betterment. Industrial work is taking on a brighter aspect and calls for material for this character of construction are increasing to a noticeable extent.

The material market at Boston is featureless. Prices are holding well to recently-established levels, and while there is a movement on the part of prospective builders to bargain for lower figures, the situation is maintaining a good uniformity. Sand, gravel, crushed stone, cement, lime and affiliated products show little or no change in quotations. Sales are much under what they should be and producers are only marketing sufficient materials to correspond with the demand.

Portland cement is at $2.85 in the wholesale market, less bags, and dealers are delivering the material at $3.50 a barrel, with 10-cent bag rebate. Crushed stone is priced at $3 a cubic yard in cargo lots, while gravel is $2.65, both for 1½ and ¾-inch sizes. Sand is selling in the local wholesale market at $2 a cubic yard, as against $3 at this time a year ago.

Barreled lime is around the $3 and $4 levels for delivery on the job, according to size barrel. Warehouse prices are close to $25 a ton for finishing lime and $21 for common hydrated. Wall plaster, in cloth, is being retailed at $24 a ton, while sanded material is $21, delivered.

Providence, R. I., dealers are still holding to a little higher levels than prevailing in Massachusetts centers. Portland cement is selling for $4 a barrel, with sack rebate of 7½ cents. Barreled lime, 180 pounds, is $3.25, and 280 pounds, $4.50. Hydrated lime, bagged, is $1.40 per 100 pounds, and finishing material, $1.50. Wall plaster, neat, in cloth, is quoted at $24 a ton in 100-pound bags, and sanded plaster at around the $21 mark. Crushed stone is being delivered at $3.75 a yard, while good grade building sand is $2.

New York

Construction work at New York is being concentrated on housing operations and the call for materials for new apartments and dwellings is growing encouraging. The general tendency "to wait" is growing less pronounced, and the near-stability in the price situation is having its effect in this direction. There have been no changes of any important moment during the past fortnight.

Local material dealers report that the bulk of call is now drifting towards speculative construction, with alteration and repair jobs absorbing a fair amount of materials. The outlook for summer and fall building is improving.

Roadbuilding is proving one of the leaders in the call for rock product materials in the upper districts of the state, and many thousands of dollars are being expended in this direction by the state, different counties and cities. Crushed stone is finding some ready takers in certain sections.

The New York City material market is operating without much interest. Portland cement holds at $3.20 a barrel, with bag rebate of 10 cents. Sand is being delivered to jobs in the different boroughs at $1.80 a cubic yard, while gravel is selling at $4.25 a cubic yard, both 1½ and ¾-inch stock. Crushed stone is priced at $4 a yard.

Common lime in standard 300-pound barrel is quoted at $4.50 a barrel, delivered, while finishing lime in same size container is $4.70. Hydrate finishing lime in cloth bags is $28 a ton, and common hydrate, $22.50. Plaster ranges from $18 to $23 a ton, the former being for lath mortar in cloth bags, and the latter figure for finishing plaster in cloth. Barreled material is selling for $4.50 in 250-pound barrels, and $5.85 for 320-pound.

The wholesale market at New York is rather sluggish, and there are few sales being made of any consequence. Gravel is priced at $2.50 in carload lots, and sand is selling for $1.25 a cubic yard. Portland cement, alongside dock to dealers is $2.40 a barrel in cargo quantities. Hydrated lime at the warehouse is $21 a ton for finishing material, and $19 for common. Lump lime is $3.50 per 200-pound barrel, with barrel rebate of 10 cents, for finishing, and $3.30 for common lump lime.

The building stone market is rather dull, and stone dealers in the big majority do not look for much improvement before fall. Indiana limestone is selling for $1.78 a cubic foot at New York, and Kentucky limestone, $2.27. Sandstone ranges from $1.75 to $2.10, while bluestone is around the $2 mark. Selected white Vermont marble, sawed, is selling at $3 a cubic foot, and South Dover material, mill block, is priced at $2.25.

Conditions in the Lehigh Valley

Production of cement in the Lehigh Valley district of Pennsylvania is beginning to lag. The lessened call for material for domestic consumption, coupled with an export market that has reached a negligible point, has affected the different mills to an extent of cutting down operating forces and continuing under considerably curtailed output.

Some of the larger plants have not, as yet, seen fit to make any decided "slash," and such mills as the Atlas Portland Cement Co., at Northampton, plants of the Alpha and Lehigh companies are maintaining a good rate of production. Shipments during the past fortnight have been fair, and cars are available in such quantity as desired. At Coplay, conditions are quite stagnant, and few of the mills are operating. It is generally reported that there will be a starting up of the different plants in this district after July 4, but no definite announcement has come.

Recent figures of production at the plant of the Atlas Portland Cement Co. indicate a greater increase in mill cost than in selling price for a period dating from 1919 to 1920. The advance in manufacturing cost was 30 cents a barrel in 1920, as compared with previous months, particularly with respect to the time that the government fixed the price of cement at $1.75 a barrel. The increase was due to a 46-per cent advance in labor cost, 20-per cent increase in the cost of coal, and 23-per cent increase in the cost of materials and supplies.

At Bessemer, Pa., the Bessemer Limestone and Cement Co. is maintaining active production at its local cement mill, and recent shipments have broken all former records. In one day a total of 4400 barrels of material was sent from the mill. The current output is well around the 3000-barrel a day mark, and prospects are for an increase in this production at an early date, reaching, it is expected, close to 4000 barrels a day. The company is said to have orders on hand to insure maximum operations for at least four months to come, and with sufficient business in sight thereafter to carry the mill at about the same point for the remainder of the year. The material is now priced at $1.80 a barrel at the mill.

Plant Activities

The Industrial Limestone Co., Hecktown, Pa., is operating under maximum output at its local plant, and both day and night shifts are now being used. It is said that a large amount of business has been booked.

The Keenan Structural Slate Co., First National Bank Building, Bangor, Pa., is planning for the erection of an addition to its slate mill at Penn Argyle, to be one-story, 30x110 ft. H. C. Dilliard, East Bangor, Pa., is engineer for the company.

Editorial Comment

Business Picking Up

A very large quarry enterprise has prepared for the benefit of its staff a schedule of operations for the current season, which shows that a large loss is expected in the early operating months, decreasing gradually until the late fall months when sufficient profit is expected so that the company may break even for the whole year. This is not a guess but a carefully prepared estimate. Therefore, for those who can hang on, there is expectation of large production and fair prices by fall.

The most disturbing element in the general building situation today is the labor situation. There have been strikes or lockouts in nearly every large city and in many smaller ones, since May 1 or June 1, when contracts with building trade unions expired. These are being slowly adjusted individually and a general improvement slowly follows in each locality. The uncertainty as to the future of freight rates continues and seems likely to be the most disturbing element for the balance of this season.

The one redeeming feature in the present lull is the enormous amount of construction work of all kinds being held in abeyance. Let the retarding factors be once settled, one way or the other, and we may be sure of the biggest building boom ever.

Freight Rates

Producers of mineral aggregate must keep up their fight for lower freight rates—apparently indefinitely. Those who have put their sole reliance on association activities, national or local, probably have not been altogether wise. Each and every producer must also use his individual effort with his local railway traffic men. He must not be discouraged by one, two, five or a score of rebuffs. Persistence is bound to win in the end. The railways are weakening.

The Louisville and Nashville is one of the railways to recognize recently the fact that lower freight rates on road materials did not mean charity to the producers, but was a case of accepting or rejecting needed business. Other railways, particularly in the South, are sure to follow suit. Probably any reductions that come this year will come thus "voluntarily" from the railways.

However, don't lose sight of the fact that the national and local associations have had a very powerful effect in making the railways see the light of day. They should be encouraged to keep up the good work. It is reported that the National Association of Sand and Gravel Producers is by no means ready to abandon its fight, in spite of the railway executives' rebuff of June 2.

Fine for Lawyers

Coroner's juries of the building industry, under one name or another, are everywhere engaged in finding out who killed Jack of the house that wasn't built. Discoveries of genuine graft on the part of some few labor union leaders, building material producers and contractors in New York City, Chicago, and possibly other big cities have given lawyers the opportunity of a lifetime. There is hardly a community, big or little, that does not sense graft and all kinds of crime in the building trades as the cause of the business depression. Investigating committees by the score are trying business men, not in the courts, but in the newspapers. With half-baked ideas and theories and with misinterpretation of statements from unwilling witnesses, reputable business men are made to appear as the worst type of criminals.

Practically every decent business man, be he a producer of building materials or anything else, wants to see profiteers and real criminals in his industry and in every industry run to the ground—for the simple reason that practically every business man is an honest man and has some pride and regard for his own industry if not for the public welfare.

How many investigators and newspaper reporters who accuse this, that or the other man of all manner of crimes ever take into consideration that the great majority of all men are as honest as themselves, or we would not have either business or government!

Is it a crime to make a profit or must an industry be so inefficiently conducted that one producer must cut his competitor's throat or have his own cut? Must he be made to live from hand to mouth? Must he be made to bankrupt his competitor? What does the public profit in the end from driving an industry out of existence? Is the public welfare served by tying up capital in superfluous plants? Somebody must surely exercise a certain amount of restraint on cut-throat methods of business, just as much as on monopolies. The wisest men in the government, as well as in business, want to see it done legitimately.

The public welfare must and will be guarded, but what the public needs is a more liberal view, or a more thorough study, of just what its welfare consists of. As one of the same dear public, and having some knowledge of the characters of the business men accused and with some knowledge of the newspaper game, we would a lot rather trust our share of public welfare to care of broad-gauge far-sighted business men, than to lawyers, newspaper reporters and politicians—if for no other reason than because these same business men, with their large and varied interests, have a larger stock of public welfare at stake than their accusers.

Accident Prevention

Dangers in Using Low-Grade Foreign Detonators

By Charles E. Munroe
Chief Explosives Chemist, U. S. Bureau of Mines

IT HAS BEEN RECENTLY LEARNED that certain foreign manufacturers are offering for importation into this country detonators at greatly reduced prices, some of these detonators being of such low grade (No. 4), that their use would greatly increase the dangers in blasting.

Detonators and electric detonators are used in initiating the explosion of the various high explosives that are now so extensively employed in a great variety of quarrying operations. Originally, a large number of different grades (or "strengths") of detonators and electric detonators were marketed, the grade number indicating the weight of the charge of fulminating material contained in the copper case of the detonator.

Study of the subject made it evident that it is good practice to employ in all instances and with all high explosives a high-grade detonator, even though the explosive is normally sensitive to lower-grade detonators. It was found that many explosives, even dynamite, which are sensitive when newly made become progressively less sensitive with time; that in many instances an explosive in the bore-hole becomes less sensitive because of wetness of the bore-hole and other causes, such as hard pressing while tamping; besides, unless extreme care is practiced in charging the priming cartridge containing the detonator into the hole, the detonator might be wholly or partly pulled out of the cartridge so as to leave an intervening space between the detonator and explosive charge. Obviously, under these circumstances, a high-grade detonator is much more likely to fire the shot than a weaker detonator would, thus greatly reducing the chances of a misfire, delayed shot, imperfect explosion, or simple ignition.

Consequently, a campaign was undertaken to secure the elimination of low-grade detonators. For a time this was opposed by many on the score of economy, as the lower grade detonator might cost one or two cents less than the higher grade one. However, the folly of such false economy has been repeatedly demonstrated, for not only does the use of low-grade detonators jeopardize life and property, but the increased cost resulting from a misfire, which requires the drilling of a new hole or holes and the use of additional explosive, exceeds many times the small difference in cost between a low-grade and a high-grade detonator.

With the introduction of permissible explosives, this view became widely recognized, and, when Hall and Howell,* in reporting the results of their exhaustive investigations of detonators said, of the more efficient electric detonators, "The results of the experiments described in this bulletin show that the average percentage of failures of explosives to detonate was increased more than 20 per cent when the lower grades of electric detonators were used instead of No. 6 electric detonators, and was increased more than 50 per cent when these lower grades were used instead of No. 8 electric detonators," it was generally adopted. In fact, under date of July 15, 1914, the director of the bureau was informed by the secretary of the Institute of Makers of Explosives that at the last meeting of the Institute the resolution of the committee recommending the elimination of the manufacture and sale of detonators weaker than No. 6 strength was unanimously adopted, and that the secretary had been instructed to write a letter to the manufacturers of detonators informing them of the action of the Institute. This policy has contributed greatly to the increase in safety in the use of explosives in this country.—U. S. Bureau of Mines, Reports of Investigations.

*Hall, Clarence, and Howell, S. P. "Investigations of Detonators and Electric Detonators," Bull. 59, Bureau of Mines, 1913, p. 6.

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Safety Methods in the Coal Mill

A SURVEY of nearly all the cement plants in this country with special attention to the personnel, habits, equipment, and type of construction in the coal-grinding departments has revealed a number of interesting conditions.

It is natural to suppose that an outsider can see things that may be of vital importance but which the men on the job would overlook or deem unimportant because of their daily contact and familiarity with them.

While working conditions in the coal mill frequently are not of the best, nevertheless the men employed here should be selected with great care. Efforts should be made to get good conscientious workmen, who realize that they are on a job that requires constant attention to equipment and working methods. A workman whose appearance and habits reveal a generally shiftless character cannot be relied upon to give the details of this work, which is important from the standpoint of safety as well as production, the attention it deserves. It would seem unnecessary to point out the foolhardiness of employing a man in this department who could not understand the language of his fellow-workers. Nevertheless, it was found in several instances that men working in the coalroom could neither speak nor understand the language of their foreman. In case of an accident or emergency, the predicament of the man in charge who could not give orders direct can be realized.

In mill after mill evidence was found of a great amount of coal dust, an element of danger as well as of annoyance. In most cases this could have been eliminated by a little mechanical fixing, in some instances only a few hours' work. On the other hand, a number of plants have installed motors and other electrical equipment outside of the millroom for the removal of dust. This method is very good and goes a long way towards the prevention of disastrous coal dust explosions.

All cement plant operators will agree that good housekeeping in a coal mill is absolutely necessary for safety and continuous operation, and where this policy is enforced the cost of operation is small; but where it is neglected the cost is high and it seems impossible to keep up the work. That a mill is old does not excuse the accumulation of dust in this department.—*"Accident Prevention Bulletin," Portland Cement Association.*

New Machinery and Equipment

The "Wullstein" Gravitation Screen

THE "Wullstein" gravitation screen is composed of a series of steel teeth, securely fastened into bars of steel, the teeth placed alternately up and down across the bars and the completed bars placed in units on an incline so as to form the screening surface of the screen. As the material goes down the incline, it gravitates in three directions from the surfaces of the higher teeth to the lower teeth. In its course down the screen, all of the fine becomes separated from the coarse material before it reaches the bottom of the incline.

The drop from bar to bar sets the coarse material into rotary motion, throwing off all fine particles, which drop through the screen, while the coarse goes on to be returned to the rolls for re-crushing.

Owing to the space between the teeth (which is always ample, even on the screen used for the finest of screening), it is impossible for the "Wullstein" gravitation screen to become clogged at any time. The material can be wet or dry—both consistencies are handled with perfect ease and with maximum results. The screenings are always uniform and complete, according to the manufacturer.

The screen stands perfectly still. As the "feed" runs down over the surface, the power of gravitation operates, allowing only the fine particles of the material to fall between the evenly spaced, irregular steel teeth. There is constant agitation of the material, enabling all loose fine substances to separate from the coarse naturally. The whole operation of screening is noiseless, speedy and completely efficient—according to the claims made by the manufacturer. It requires no power to operate, no line shafting, no belts, no pulleys, jack shafts, vibrations, ratchets, springs nor oil, it is claimed.

To install the screen is a very simple matter. The screen is pivoted on upright timbers (the same that support the hopper), by two ⅝-in. bolts. It is supported near the bottom by two iron braces, running out from and attached to the lever shaft, and controlling the angles at which the screen rests while being used. It is strongly constructed—heavily bolted and braced—the manufacturer claims.

A screen weighs approximately 100 lbs. The screening surface of each complete unit is 2 ft. wide by 4 ft. long. A double screen weighs about 150 lbs. and is 4 ft. wide by 4 ft. long.

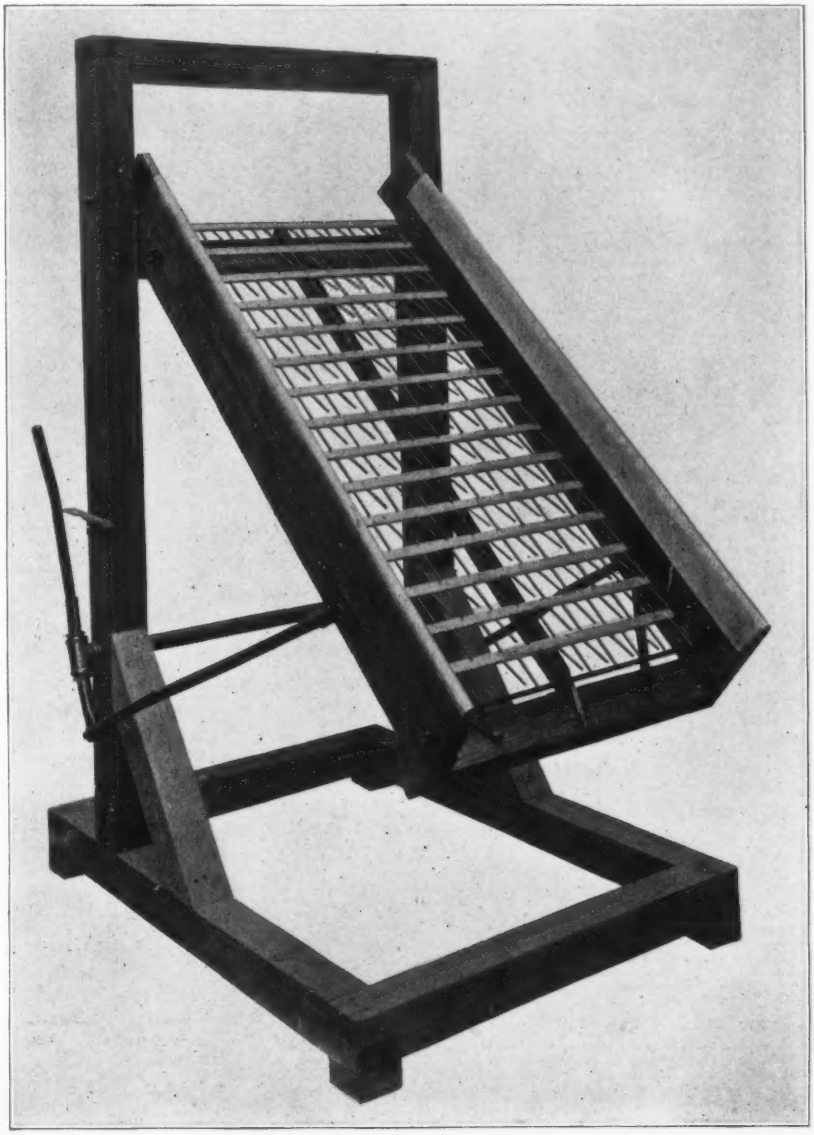
The screen is manufactured by the International Gravitation Screen Co., 271 C Street, Salt Lake City, Utah.

H. W. Caldwell & Son Co. Bought by Link-Belt Co.

THE LINK-BELT CO., Chicago, Ill., has acquired all of the capital stock of the H. W. Caldwell & Son Co., and Frank C. Caldwell has been elected a director of the Link-Belt Co., according to Charles Piez, president of the Link-Belt Co.

Two experienced and successful companies in the conveyor world have thus joined forces, with the result that the Link-Belt Co. has added two new lines, Helicoid conveyors and power transmission machinery, to its line of manufactures. While the H. W. Caldwell & Son Co.'s plant will continue to operate under separate corporate existence and under its present name, the joint facilities of the two companies, and the broader avenues of distribution of the Link-Belt Co., ought to prove of distinct advantage to the customers of both.

There will be no modifications of the policies of the Caldwell plant, no impairment of its service to its customers, no change in the diversity or character of its product, it is announced. The plant management will remain substantially the same, and the new owners, like the old, will proceed on the theory that the goodwill of its customers is the company's best asset.



The "Wullstein" Gravitation Screen

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Blakeslee, N. Y.	1.00	1.35	1.35	1.25	1.25	.....
Buffalo, N. Y.	1.30 per net ton, all sizes					
Burlington, Vt.	1.00	.....	2.50	2.00	2.00	.....
Chaumont, N. Y.	1.75	1.75	1.75	1.50	1.50	1.50
Cobleskill, N. Y.	1.25	1.25	1.25	1.25	1.25	.....
Coldwater, N. Y.	1.50 per net ton, all sizes					
Eastern New York	.90	1.80	1.70	1.60	1.60	1.50
Eastern Penna.	1.00	.....	1.85	1.85	1.85	1.85
Munns, N. Y.	1.00	Other sizes 1.50				
Walford, Pa.	1.40	1.60	1.75	1.75	1.60	1.60
Western New York	.70	1.25	1.25	1.25	1.25	1.25
CENTRAL						
Alden, Ia.	.80@1.00	.80@1.00	1.50	1.45	.....	.....
Alton, Ill.	2.00	.....	1.50	1.50	.....	.....
Bettendorf, Ia.	All sizes, 2.00 cu. yd. f.o.b. quarry					
Brillion, Wis.	1.00	.....	1.20	1.00	1.00	.....
Buffalo, Ia.	1.00	1.35	1.45	1.25	1.35	1.35
Chicago, Ill.	1.20	1.60	1.20	1.20	1.20	1.20
Columbia, Ill.	2.15	1.90	2.00	2.00	1.90	1.90
Dundas, Ont.	1.00	1.50	1.50	1.50	1.25	1.20
Eden and Knowles, Wis.	1.30	1.30	1.30	1.30	1.30	.....
Greencastle, Ind.	1.50	1.35	1.25	1.10	1.10	1.10
Illinois, Southern	1.75	1.60	1.60	1.50	1.60	.....
Kokomo, Ind.	1.10	1.25	1.25	1.10	1.10	1.10
Krause or Columbia, Ill.	1.80	1.30	1.50	1.40	1.30	1.30
Lannon, Wis.	1.00	1.10	1.10	1.10	1.10	1.10
Marblehead and Brillion, Wis.	1.10	.....	1.20	1.10	1.10	.....
Montrose, Ia.	1.35	1.75	1.75@1.85	1.75	1.65@1.75	.....
Oshkosh, Wis.	1.40 per ton, all sizes					
River Rouge, Mich.	1.50	1.65	1.65	1.50	1.50	1.50
Sheboygan, Wis.	1.25	1.25	1.25	1.25	1.25	1.25
Stolle, Ill. (I. C. R. R.)	1.75	1.60	1.60	1.50	1.50	1.50
Stone City, Ia.	.80	.....	1.50	1.40	1.30	.....
Toronto, Canada	1.90	2.40	2.40	2.40	2.15	2.10
SOUTHERN:	These prices include 90c freight					
Cartersville, Ga.	.....	1.85	1.60	1.60	1.60	.....
Chickamauga, Tenn.	1.00	1.00	1.25	1.00	1.00	1.00
Chico, Texas	1.10	.....	1.25@1.50	.....	1.25	.....
El Paso, Tex.	1.00	1.00	1.00	1.00	1.00	.....
Fort Springs, W. Va.	1.55	1.70	1.75	1.75	1.50	.....
Garnet and Tulsa, Okla.	.....	.....	1.60	1.60	1.45	.....
Ladds, Ga.	1.75	1.75	1.75	2.00	2.00	.....
New Braunfels, Tex.	.60	1.50	1.50	1.25	1.25	1.25
Portland, Ga.	.75	2.00	1.50	1.50	1.50	1.50
WESTERN:						
Atchison, Kans.	.50	2.10	2.10	2.10	2.10	2.10
Blue Springs and Wymore, Neb.	.20	1.65	1.65	1.60@1.65	1.45@1.50	1.40
Cape Girardeau, Mo.	1.50	.....	1.50	1.50	1.25	.....
Kansas City, Mo.	1.00	2.00	2.00	2.00	2.00	2.00

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Baltimore, Md.	1.25	2.50	2.35	2.25	2.00@2.25	2.00
Bernardsville, N. J.	2.00	2.20	2.00	1.80	1.50	.....
Branford, Conn.	.80	1.95	1.80	1.60	1.40	.....
Bound Brook, N. J.	2.00	2.30	2.00	1.70	1.60	.....
Dresser Jct., Wis.	1.00	2.45	2.45	2.30	2.00	.....
Duluth, Minn.	1.00	2.25	2.00	1.50	1.40	1.40
Dwight Station, Calif.	.75@1.00—all sizes					
E. Summit, N. J.	2.10	2.35	2.15	1.75	1.75	.....
Eastern Mass.	.60	1.95	1.75	1.50	1.50	1.50
Eastern New York	.90	1.80	1.70	1.60	1.60	1.50
Eastern Penna.	1.60	2.25	1.95	1.80	1.80	1.70
New Britain, Middlefield, Rocky Hill, Meriden, Conn.	.60@1.00	1.60@1.80	1.60@1.80	1.40@1.50	1.20@1.30	.....
Oakland, Calif.	1.75	1.75	1.50	1.50	1.50	1.50
Richmond, Calif.	.50*	.....	1.75*	1.50*	1.50*	.....
San Diego, Calif.	.50@.70	1.45@1.75	1.40@1.70	1.30@1.60	1.25@1.55	1.25@1.55
Springfield, N. J.	2.00	2.40	2.10	1.80	1.75	1.75
Westfield, Mass.	.60	1.35	1.30	1.20	1.10	.....

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Ableman, Wis.	1.60	.....	1.30	1.50	1.20	.....
Alexandria Bay, N. Y.	1.60	.....	1.30	1.50	1.20	.....
Berlin, Wis.	1.60	.....	1.40	1.50	1.30	.....
Columbia, S. C.—Granite	.75	.....	2.75	2.50	2.35	.....
Dell Rapids, S. D.	1.00	.....	2.10	2.10	2.10	.....
Dundas, Ont.—Flint	1.10	1.10	1.10	1.10	1.10	1.10
Eastern Penna.—Sandstone	1.10	2.00	2.00	1.70	1.70	1.70
Eastern Penna.—Quartzite	.90	1.70	1.55	1.30	1.30	1.10
Holton, Ga.—Granite	.40	.....	2.50	2.25	2.25	2.00
Lohrville, Wis.	1.60	.....	1.30	1.50	1.20	.....
Los Angeles, Cal.—Granite	.....	1.25@1.50	1.15@1.40	1.15@1.40	.....	.....
Macon, Ga.—Granite	.50	.....	2.50	2.25	2.00	2.00
Middlebrook, Mo.—Granite	3.50@4.00	.....	.....	2.00@2.25	.....	1.25@1.75
Red Granite, Wis.	1.60	.....	1.30	1.50	1.20	.....
Sioux Falls, S. D.	1.00	.....	2.00	2.10	2.00	.....
Stockbridge, Ga.—Granite	.50	2 00	1.90	1.75	1.75	.....
Utley, Wis.	1.60	.....	1.30	1.50	1.20	.....

*Cubic yard. †Agrl. lime. ||R. R. ballast. ‖Flux ‡Rip-rap. a 3-inch and less.

Agricultural Limestone

EASTERN:

Chaumont, N. Y. — Analysis, 95% $CaCO_3$, 1.14% $MgCO_3$ — Thru 100 mesh; sacks, 4.50; bulk 2.75

Coldwater, N. Y.—Analysis, 56.77% $CaCO_3$, 41.74% $MgCO_3$, 70% thru 200 mesh, 95% thru 50 mesh, sacks 4.00; bulk 3.00

Grove City, Pa. — Analysis, 94.75% $CaCO_3$, 1.20% $MgCO_3$ — 70% thru 100 mesh; 80 lb. ppr., 5.50; bulk 4.50

Jamesville, N. Y. — Analysis, 89.25% $CaCO_3$, 5.25% $MgCO_3$; sacks, 4.50; bulk 2.75

New Castle, Pa.—89% $CaCO_3$, 1.4% $MgCO_3$—75% thru 100 mesh, 84% thru 50 mesh, 100% thru 10 mesh; sacks, 4.50; bulk 3.00

Syracuse, N. Y. — Analysis, 90% carbonates—50% thru 100 mesh, 90% thru 50 mesh; sacks, 3.50; bulk 2.75

Texas, Md.—Analysis, 58.02% $CaCO_3$, 37.3% $MgCO_3$—50% thru 50 mesh; bags, 4.25; bulk 2.50

Walford, Pa. — 50% thru 100 mesh, 60% thru 50 mesh, 100% thru 10 mesh; sacks, 4.75; bulk 3.00

West Stockbridge, Mass., Danbury, Conn., North Pownal, Vt.—Analysis, 90% $CaCO_3$ — 90% thru 100 mesh; paper bags, 6.25—90% thru 50 mesh; paper bags, 5.25; bulk 3.25

West Stockbridge, Mass.—Analysis, 95% combined carbonates; 33% thru 200 mesh, 66% thru 100 mesh, 100% thru 20 mesh; sacks 5.25@5.50; bulk 3.25

Williamsport, Pa. — Analysis, 88-90% $CaCO_3$, 3-4% $MgCO_3$—50% thru 50 mesh; paper. 5.50; bulk 4.00

CENTRAL:

Alden, Ia.—Analysis, 99.16% $CaCO_3$ ..... .80

Alton, Ill. — Analysis, 96% $CaCO_3$, 0.3% $MgCO_3$—50% thru 4 mes. 4.50

Bedford, Ind. — Analysis, 98.5% $CaCO_3$, .5% $MgCO_3$—90% thru 10 mesh ..... 1.60@2.00

Belleville, Ont. — Analysis, 90.9% $CaCO_3$, 1.15% $MgCO_3$—45% to 50% thru 100 mesh, 61% to 70% thru 50 mesh; bulk 2.50

Buffalo, Ia.—90% thru 4 mesh 1.00

Cape Girardeau, Mo.—Analysis, 90% $CaCO_3$, .044% $MgCO_3$—50% thru 4 mesh 1.50

Chicago, Ill.—Analysis, 53.63% $CaCO_3$, 37.51% $MgCO_3$—90% thru 4 mesh 1.50

Columbia, Ill., near East St. Louis—½-in. down ..... 1.25@1.80

Detroit, Mich.—Analysis, 88% $CaCO_3$, 7% $MgCO_3$—75% thru 200 mesh, 2.50@4.75—60% thru 100 mesh ..... 1.80@3.80

Elmhurst, Ill. — Analysis, 35.73% $CaCO_3$, 20.69% $MgCO_3$—50% thru 50 mesh 1.25

Greencastle, Ind. — Analysis, 98% $CaCO_3$—50% thru 50 mesh 2.00

Lannon, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$—90% thru 50 mesh 2.00

Marblehead, O.—Analysis, 83.54% $CaCO_3$, 14.92% $MgCO_3$—52.4% thru 100 mesh, 59% thru 50 mesh, 100% thru 10 mesh; sacks, 5.25; bulk 3.00

Limestone screenings; bulk 1.50

McCook, Ill.—Analysis, 54.10% $CaCO_3$, 45.04% $MgCO_3$—100% thru ¼-in. sieve, 78.12% thru No. 10, 53.29% thru No. 20, 38.14% thru No. 30, 34.86% thru No. 50, 22% thru 100 ..... 1.50

Milltown, Ind. — Analysis, 93.10% $CaCO_3$, 3.2% $MgCO_3$ — 24% thru 200 mesh, 33.2% thru 100 mesh, 40% thru 50 mesh, 50% thru 40 mesh, 70% thru 20 mesh 1.65

Mitchell, Ind.—50% thru 100 mesh 2.00

Montrose, Ia.—90% thru 100 mesh 1.25

Ohio (different points), 20% thru 100 mesh; bulk ..... 1.50@1.75

Piqua, O. — Analysis, 82.8% $CaCO_3$, 8.2% $MgCO_3$; neutralizing power in terms of calcium carbonate, 95.3%—50% thru 100 mesh ..... 3.25@5.00

50% thru 50 mesh ..... 1.75@2.00

Ridgeville, Ind.—Analysis, 98% $CaCO_3$ 100% thru 4 mesh 1.75

River Rouge, Mich. — Analysis, 54% $CaCO_3$, 40% $MgCO_3$; bulk ..... .80@1.40

Spring Valley, O. — Analysis 95.92% $CaCO_3$, 2.15% $MgCO_3$; 100% thru 10 mesh, bulk 3.00

Stolle, Ill., near East St. Louis on I. C. R. R. — Thru ¼-in. mesh — Analysis, 89.61% to 89.91% $CaCO_3$, 3.82% $MgCO_3$ 1.75

(Continued on next page.)

Agricultural Limestone

(Continued from preceding page.)

Stone City, Ia.—Analysis, 98% $CaCO_3$—90% thru 50 mesh	.80
Toledo, O.—Analysis, 52.72% $CaCO_3$, 43% $MgCO_3$—20% thru 100 mesh, 30% thru 50 mesh, 80% thru 100 mesh, 100% thru 5/32 screen	1.80
Whitehill, Ill.—Analysis, 97.12% $CaCO_3$, 2.50% $MgCO_3$—90% thru 100 mesh	5.00
50% thru 50 mesh	2.00
Yellow Springs, O.—Analysis, 96.08% $CaCO_3$, .63% $MgCO_3$—32% thru 100 mesh, 58% thru 50 mesh, 99% thru 10 mesh: sacks, 8.25; bulk	5.25
SOUTHERN:	
Blowers, Fla.—Analysis, 98% combined carbonates—75% thru 200 mesh	4.75
Cartersville, Ga.—Analysis, 96% combined carbonates—pulverized limestone	1.75@2.00
Claremont, Va. (Marlime)—Analysis, 90% $CaCO_3$, 2% $MgCO_3$—90% thru 50 mesh; bulk	3.50
Dittlinger, Tex.—Analysis, 99.09% $CaCO_3$, .04% $MgCO_3$—90% thru 100 mesh	2.00@3.00
90% thru 4 mesh	1.00@2.00
Grovania, Ga.—Analysis, 95% $CaCO_3$, no $MgCO_3$—50% thru 100 mesh	2.50
Hopkinsville, Ky.—Analysis, 94.6 to 98.1% $CaCO_3$; bulk	2.00
Knoxville, Tenn.—Pulverized	2.50
90% thru 100 mesh	2.00
90% thru 50 mesh	1.50
Ladds, Ga.—Pulverized limestone	2.50
Linnville Falls, N. C.—Analysis,, 53% $CaCO_3$; 42% $MgCO_3$—50% thru 100 mesh; sacks, 4.50; bulk	3.00
Mascot, Tenn.—Analysis 52% $CaCO_3$, 38% $MgCO_3$.	
80% thru 100 mesh	3.00
All thru 10 mesh	2.50
80% thru 200 mesh	5.00
Paper bags, $1.50 extra per ton; burlap, $2.00 extra per ton.	
Maxwell, Va.	2.50
Mountville, Va.—Analysis, 76.6% $CaCO_3$, 22.83% $MgCO_3$—100% thru 20 mesh; 100 lb. ppr., 7.00; bulk	5.00
Ocala, Fla.—Analysis, 98% $CaCO_3$—75% thru 200 mesh	4.50
WESTERN:	
Colton, Calif.—Analysis, 95% $CaCO_3$, 1½% $MgCO_3$—all to pass 14 mesh; bags, 6.50; bulk	5.50
Sacks, 15c extra, returnable.	
Garnett, Okla.—Analysis, 86% $CaCO_3$, 50% thru 4 mesh	.50
Kansas City, Mo., Corrigan Sid'g—50% thru 100 mesh; bulk	2.00
Terminus, Calif.—Analysis, 96.2% $CaCO_3$, .04% $MgCO_3$—60% thru 200 mesh, 90% thru 100 mesh, 95% thru 50 mesh, 100% thru 4 mesh; sacks, 6.00; bulk	5.25
Tulsa, Okla.—90% thru 4 mesh	.50

Miscellaneous Sands

Silica sand is quoted washed, dried and screened unless otherwise stated.

GLASS SAND:	
Beach City, O.—Washed and screened	3.00
Berkeley Springs, W. Va.	2.25@2.50
Cedarville and South Vineland, N. J.	2.00
Cheshire, Mass.	5.00@7.00
Columbus, Ohio	2.50@3.00
Gray Summit, Mo.	2.50@4.00
Hancock, Md.—Damp	2.50@3.50
Klondike and Pacific, Mo.	2.50@3.00
Mapleton, Pa.—Dry	2.75
Glass, damp	2.25
Massillon, Ohio	3.50
Millington, Ill.	1.75
Mineral Ridge, Ohio	3.00
Montoursville, Pa.—Green, washed	2.00@2.25
Morgantown, W. Va.	3.00@3.25
Oregon, Ill.—Large contracts	1.75
Ottawa, Ill.	1.25@2.25
Pittsburgh, Pa.—Dry, 4.00; damp	3.00
Rockwood, Mich.	3.25@3.50
St. Marys, Pa.—Green	2.50
Thayers, Pa.	1.75@2.00
Utica, Ill.	1.75@2.25
FOUNDRY SAND:	
Albany, N. Y.—Glass and sand blast	2.00@7.00
Core	1.50@2.50
Furnace lining	2.50@3.00
Molding fine, coarse and brass	2.00@2.75
Allentown, Pa.—Core	1.50@1.75
Molding coarse	1.50@1.75
Arenzville, Ill.—Molding fine	1.40@1.60
Beach City, O.—Core, washed and screened	2.00@2.50
Furnace lining	2.50@3.00
Molding fine and coarse	2.25@2.50
Bowmantown, Pa.—Core	1.35@1.50
Molding, coarse	1.80@2.00

(Continued on next page)

Wholesale Prices of Sand and Gravel

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 inch down	Sand, ¼ inch and less	Gravel, ½ inch and less	Gravel, 1 inch and less	Gravel, 1½ inch and less	Gravel, 2 inch and less
EASTERN:						
Attica, N. Y.	.75	.75	.75	1.00	1.00	1.00
Buffalo, N. Y.	1.10	.95	.85	.85	.85	.85
Erie, Pa.		1.00	1.65		1.75	
Farmingdale, N. J.	.48	.48	1.75	1.75	1.50	
Hartford, Conn.	.90		1.25	1.15	1.15	1.15
Leeds Junction, Me.		.60@ .75	2.00	1.75	1.65	1.50
Ludlow, Mass.	.75•	.75•	1.70		1.50•	1.50•
Philadelphia, Pa.	.75	.75		1.65	1.50	
Pittsburgh, Pa.		1.30	1.30	1.30	.85	.85
Portland, Maine		.50@ .60		1.50		1.35
Texas, Md.		1.00		Pure white sand, 1.50		
Washington, D. C.	.75	.75	2.00	1.40	1.20	1.20
CENTRAL:						
Alton, Ill.		.85				
Anson, Wis.	.50	.50		1.00		1.00
Attica and Covington, Ind.	.90	.90	.90	1.00	1.00	1.00
Barton, Wis.		.60	.70	.70	.70	.70
Beloit, Wis.		.60	.60		.60	
Chicago, Ill.		1.75@2.23	1.75@2.43			
Cincinnati, O., and vicinity	.65	.60	.85	.85	.85	.85
Columbus, O.	.90	.90@1.25	1.25	.90@1.25	.90@1.25	.90@1.25
Des Moines, Ia.	.90	.65	1.60	1.60	1.60	1.60
		25% gravel, .90; 50% gravel, 1.15				
Detroit, Mich.	.65	.65	.95	.95	.95	.95
Earlestead (Flint), Mich.	.70		60-40 sieves, .85; Pebbles, .95			
Eau Claire, Wis.	.50	.50	1.00@1.25	1.00	1.00	
Elgin, Ill.		.80	1.00	.80	.80	.80
Elkhart Lake, Wis.	.70	.58	.90	.90	.72	.72
Estill Springs, Ky.	1.15	1.15		1.00		.90
Grand Rapids, Mich.		.55		.90	.85	.85
Greenville, Mechanicsburg, O.	.80	.70	.80	1.00	.85	.80
Hamilton, O.		.90			.90	
Hawarden, Ia.		.70			1.60	
Indianapolis, Ind.	.60	.60		1.50	.75@1.00	.75@1.00
Janesville, Wis.		.65@ .75			.65@ .75	
Le Mars, and Doon, Ia.		.90		1.80		
Libertyville, Ill.		.75		.75		
Lincoln, Neb.		Sand .40, sand and gravel .80, drained for shipment				
Mason City, Ia.	.90	.80	1.90	1.80	1.70	1.65
Milwaukee, Wis.	1.15	1.15	1.25	1.25	1.25	1.25
Minneapolis, Minn.	.35@ .50	.35@ .50	1.50	1.50	1.50	1.25@1.50
Moline, Ill.	.70	.70	1.20	1.20	1.10	1.10
Oxford, Mich.		.25		.60	.50	.50
St. Louis, Mo., f. o. b. cars	1.60	1.65	1.80	1.60		1.55
Summit Grove, Clinton, Ind.	.90	90	.90	1.00	1.00	1.00
Terre Haute, Ind.	1.00@1.25	1.00	1.25	1.25	.90@1.25	.90@1.25
Winnipeg, Man.	1.90	1.90		3.25		2.85
Winona, Minn.	.70	.60	2.00	1.75	1.50	1.25
Yorkville, Moronts, Oregon and Sheridan, Ill.		.60@ .80	.70@ .80	.70@ .80	.70@ .80	.60@ .80
SOUTHERN:						
Alexandria, La.	.60@ .90					1.65@1.85
Charleston, W. Va.			Sand 1.40—Gravel 1.50			
Ft. Worth, Tex.	2.00@2.25•	2.00@2.25•	2.75@3.00•	2.75@3.00•	2.75@3.00•	
Greenville, Miss.		1.10				1.00
Jedburg, Mo.		1.05	1.20	1.00	1.00	.95
Knoxville, Tenn.	1.15	1.15		2.15	1.95	1.75
Lake Weir, Fla.		.75				
Macon, Ga.		.75@1.00				
Memphis, Tenn.	1.12	1.12				1.95
N. Martinsville, W. Va.	1.30	1.30		1.40		1.00
New Orleans, La.	1.00		1.75		1.25	
Pine Bluff, Ark.	1.25	.92		Washed gravel, all sizes, 2.30		
Roseland, La.				1.25		
WESTERN:						
Grand Rapids, Wyo.	.50	.50	.85	.85	.80	.80
Kansas City, Mo.	(Kaw River sand, car lots, .75 per ton, Missouri River, .85)					
Niles, Calif.	1.00	1.00	1.40	1.00	1.00	1.00
Pueblo, Colo.	1.25•	1.00•			1.50•	
San Diego, Calif.		.80@1.00	1.30@1.60	1.25@1.55	1.15@1.45	1.10@1.40
San Francisco, Calif.		1.00	1.00@1.20	.85@1.00	.85@1.00	.85@1.00
Seattle, Wash.	1.50•	1.50•	2.00•	1.50•	1.50•	1.50•

Bank Run Sand and Gravel

City or shipping point	Fine Sand, 1/10 inch down	Sand, ¼ inch and less	Gravel, ½ inch and less	Gravel, 1 inch and less	Gravel, 1½ inch and less	Gravel, 2 inch and less
Attica, Covington, Silverwood, Ind., and Palestine, Ill.	.75	.75	.75	.75	.75	.75
Boonville, N. Y.	.60@ .80		.55@ .75			1.00
Cape Girardeau, Mo.			River sand, 1.00 per yd.			
Cherokee, Ia.			.80 per ton—1.20 washed			
Detroit, Mich.	1.10•					
Dudley, Ky. (Crushed Sand)		1.05		1.00		
Elkhart Lake, Wis.			Washed gravel .66			
Fishers, N. Y.	.65@ .85	.75@ .85				.65@ .85
Ft. Jefferson, Mechanicsb'g, O.	.70	.60	.60			
Glenville, N. Y.				1.00•		
Hamilton, O.			6 in. and less, .20 per ton			
Hartford, Conn.		1.00•				
Hersey, Mich.				.60	.60	.60
Indianapolis, Ind.			Mixed gravel for concrete work, .65			
Janesville, Wis.		.65			.65@ .75	
Lindsay, Tex.						.60
Oxford, Mich.					.50	
Pine Bluff, Ark.			Road gravel .60			
Roseland, La.		.75				
Saginaw, Mich., f. o. b. cars		.75	1.30	1.30	1.30	1.30
St. Louis, Mo.			60% gravel, 40% sand 1.70			
Summit Grove, Ind.	.65	.65	.65	.65	.65	.65
Valde Rouge, La.						.85
Waco, Texas		.80		1.50		1.30
Yardville, N. J.		.50@ .75				
York, Pa.		1.10@1.20		(crushed rock sand)		

•Cubic yard. B Bank. L Lake. || Ballast.

Crushed Slag

City or shipping point	Roofing	¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:							
Buffalo, N. Y.	2.35	1.25	1.25	1.25	1.25	1.25	1.25
E. Canaan, Conn.	4.00	1.00	2.50	1.35	1.25	1.25	1.25
Eastern Pennsylvania and Northern New Jersey	2.50	1.20	1.50	1.20	1.20	1.20	1.20
Erie, Pa.	2.35	1.25	1.25	1.25	1.25	1.25	1.25
Emporium, Pa.		1.25	1.25	1.25	1.25	1.25	1.25
Lebanon, Pa.	2.50	.85	1.50	.85	.85	.85	.85
Sharpsville and West Middlesex, Pa.	2.00	1.30	1.70	1.30	1.30	1.30	1.30
Western Pennsylvania	2.50	1.25	1.50	1.25	1.25	1.25	1.25
CENTRAL:							
Chicago, Ill.			All sizes, $1.50, F. O. B. Chicago				
Detroit, Mich.			All sizes, 1.65, F. O. B. Detroit				
Ironton, O.	2.40		other grades 1.75@2.00				
Jackson, O.	2.00	1.35	1.70	1.35	1.35	1.35	1.35
Stuebenville, O.	2.00	1.40	1.70	1.40	1.40	1.40	1.40
Toledo, O.	2.20	1.70	1.95	1.95	1.95	1.70	1.70
Youngstown, Dover, Hubbard, Leetonia, Struthers, Steubenville, Lowellville & Canton, O.	2.00	1.30	1.70	1.30	1.30	1.30	1.30
SOUTHERN:							
Alabama City, Ala.	2.05	.80	1.00@1.25	1.15	1.05@1.10	.85@1.00	.85@ .90
Birmingham, Ala.	2.05	.80	1.25	1.15	1.10	.95	.85
Ensley, Ala.	2.05	.80	1.00@1.25	1.15	1.05@1.10	.95@1.00	.85@ .90
Longdale, Goshen, Glen Wilton & Low Moor, Va.	2.50	1.00	1.25	1.25	1.25	1.15	1.05

Agricultural Lime and Hydrate

	—Agricultural Lime— Bulk	Bags	Per Cent CaO	Per Cent MgO	Agricultural Hydrate Bags
EASTERN:					
Adams, Mass.		8.00	58	0.5	
Bellefonte, Pa.	8.50		98.2	.72	11.50
Berkeley, R. I.			**50**	**18**	**15.00**
Branchton, Pa.		5.50			
Cassadaga, N. Y.—Marl		8.00@10.00	48.07	1.08	
Chippewa, Pa.	5.50		78.67	1.33	
Hot Springs, N. C.	3.00	4.50			
Lime Ridge, Pa.	5.75		80.56-62.71	3.87-1.96	
Lime Ridge, Pa.	6.00@7.50		80.56-62.71	3.87-1.96	
Paxtang and Lemoyne, Pa.	5.50		63	3	
Rockland, Maine		8.00	65	1	
Rosendale, N. Y.	7.00		84	7	6.00
Union Bridge, Md.	11.00	5.50	73	1	13.00
Williamsport, Pa.	6.00	10.00	75	3	10.00
West Rutland, Vt.	4.50	7.50	68	3	
West Stockbridge, Mass.					15.00
Williams and Blue Bell, Pa.		8.25	57	33	11.25
York, Pa.	8.50		92.5	.03	12.00
CENTRAL:					
Alton and Hannibal, Ill.	11.50		.95		
Delaware, O.			50.0	5-12	10.00
Knowles and Valders, Wis.	5.00	9.00	55	45	12.50
Marblehead, O.			85.10	12.92	9.50
Mitchell, Ind.					12.50
Sheboygan, Wis.	5.50	8.50	58	40.5	
Woodville, Ohio			49.16	32.43	9.50
SOUTHERN:					
Burns, Tenn.	9.50		96	0.54	12.00
Claremont, Va. (Marl.)	5.00	7.00	85-95	2-5	
Erin, Tenn.	7.50@10.00		97.82	0.12	
Karo, Va.	8.50		97	1.25	
Knoxville, Tenn.	9.00		98.23		13.00
Staunton, Va.	7.50	8.75	70	10	
WESTERN:					
Colton, Calif.			**97**	**2**	**15.00**
Kirtland, N. Mex.	12.00				
San Francisco, Calif.			98-99	.5-.75	19.50
Tehachapi, Cal.	12.00@15.00	14.00@17.00	98	1.00	

Miscellaneous Sands

(Continued from preceding page)

Cleveland, O.—Molding coarse	1.50@2.00
Brass molding	1.50@2.00
Molding fine	1.50@2.25
Core	1.25@1.50
Columbus, O.—Core	.60@2.50
Brass molding	2.50
Sand blast	5.00@5.50
Glass sand	3.00
Molding, fine and coarse	2.00@2.25
Conneaut, O.—Molding fine	2.25@2.50
Molding coarse	2.00@2.25
Delaware, N. J.—Molding fine	2.00
Molding coarse	1.90
Brass Molding	2.15
Dresden, O.—Core	1.50
Molding fine and coarse	1.50@1.75
Brass molding	2.50
Dunbar, Pa.—Glass sand No. 2, damp	3.00
Traction, damp	2.75
Dundee and Chalfants, O.—Sand blast	3.00
Glass, core and traction	2.75
Molding fine and brass molding	2.25
Furnace lining	2.50
Molding coarse	2.00
Eau Claire, Wis.—Core	.75@1.25
Sand blast	3.00@4.25
Traction sand	.50
Falls Creek, Pa.—Glass sand, washed	2.50
Core sand, washed or unwashed	2.00
Furnace lining, unwashed	2.00
Molding fine, washed	2.00@2.50
Molding coarse, washed or unwashed	2.00@2.50
Sand blast, washed	3.50@4.50
Stone sawing, washed	2.00@2.50
Traction, washed	2.00@2.50
Fleetwood, Pa.—Furnace lining	2.25
Franklin, Pa. and Utica, Pa.—Traction	2.50
Brass molding	2.25
Core	1.50@2.00
Molding fine	2.25
Molding coarse	2.00
Sand blast	5.00
Greenville, Ill.—Molding coarse	1.50@1.70
Howard, O.—Glass sand	3.00@3.25
Steel molding	2.25@2.50
Joplin, Mo.—Stone sawing and roofing	1.25
Kansas City, Mo.—Missouri River core	.80
Kasota, Minn.—Molding coarse and stone sawing	1.65
Klondike and Gray Summit, Mo.—Molding fine	2.00@2.50
Molding coarse	2.50@3.00
Mapleton, Pa.—Core, furnace lining, molding coarse and brass molding	2.00@2.75
Molding fine	2.25@2.75
Roofing sand	2.00@3.00
Sand blast	1.50@2.00
Massillon, O.—Glass sand, molding fine and coarse, core, and furnace lining	3.00
Traction	2.50
Michigan City, Ind.—Core, glass, traction and brass molding	.60
Millington, Ill.—Glass, core, furnace lining, roofing and stone sawing	1.75
Mineral Ridge, O.—Core, molding, sand blast, roofing, etc., washed, screened (damp)	2.25
Montoursville, Pa.—Core and traction	1.00@1.50
Brass molding	1.25@2.00
New Lexington, O.—Molding fine	2.25
Molding coarse	2.00
Sand blast	3.00
Glass, core and traction	2.75
Furnace lining	2.50

Miscellaneous Sands

(Continued)

Brass molding	2.25
Oregon, Ill.—Core and glass sand	2.00
Furnace lining	2.00
Molding fine and coarse	1.00
Sand blast	3.50
Stone sawing	2.00
Ottawa, Ill.—Crude silica sand	1.00@1.50
Core, molding, fine and coarse	1.00@2.25
Furnace lining	1.25@2.00
Roofing and traction	1.25@5.00
Sand blast	4.00@5.00
Stone sawing	1.50
Ottawa, Minn.—Core	2.00@2.50
Glass, molding coarse, roofing, stone sawing (all crude silica)	1.25
Ridgeway, Pa.—Glass sand, green	2.25
Glass sand, wash	2.50
Molding, fine and coarse	1.20
Rockwood, Mich.—Core	2.75@3.00
Roofing	3.50
Sand blast	3.50@4.00
Round Top, Md.—Glass sand, core and roofing sand; washed, damp	1.75@2.00
San Francisco, Cal.—Glass and roofing	3.00@3.50
Core, molding fine and brass	2.30@2.60
Furnace lining and molding coarse	3.60@4.25
Coarse core sand	3.60@4.25
Sand blast	2.30@3.60
Stone sawing and traction	2.30
Thayer, Pa.—Traction	1.75
Furnace lining	1.00
Molding fine and coarse	1.00
Core, green	1.50@1.75
Tulsa, Okla.—Sand blast	6.50
Utica, Ill.—Core and furnace lining	1.25
Molding, fine and coarse	1.00
Stone sawing and roofing	1.25
Sand blast	3.50@4.50
Traction	1.75
Warwick, Ohio—Core, furnace lining, molding fine and coarse (dry)	2.50
Same, green	2.25
Wedron, Ill.—Core (crude silica)	1.00@1.25
Molding fine and coarse	1.00@1.25
Furnace lining	1.25
West Albany, N. Y.—Molding fine	2.25
Molding coarse	2.25
Winnipeg, Man., Can.—Roofing sand	4.00
Zanesville, Ohio—Molding fine and brass	1.40@2.25
Molding coarse	1.25@2.00
Furnace lining	2.50@2.75
Glass, core and traction	2.50@2.75
Sand blast	3.00
Steel molding	2.50
Pulverized silica thru 140 mesh	8.50
Thru 200 mesh	9.50

Talc

Prices given are per ton f. o. b. (in carload lots only) producing plant, or nearest shipping point.

Baltimore, Md.—Crude talc	4.00
Cubes	50.00
Blanks, per lb.	.08
Chatsworth, Ga.—Crude talc	8.00@10.00
Ground talc (150-200 mesh), bags	12.50
Pencils and steel workers' crayons, per gross	1.50@ 2.00
Chester, Vt.—Ground talc (150-200 mesh), bulk, 10.50@12.00; bags	12.00@14.00
Emeryville, N. Y.—150-200 mesh; bags	14.00
Glendale, Calif.—Ground talc (150-200-mesh	16.00@30.00
(Bags extra)	
Gouverneur, N. Y.—Crude talc	4.00
Ground talc (150-300 mesh)	17.00@24.00
Henry, Va.—Crude talc (lump mine run), per 2000-lb. ton	2.75@ 3.25
Ground talc (20-50 mesh), bags, 7.00@7.50; bulk	5.50@ 6.00
Ground talc (150-350 mesh); bags, 9.50@11.25; bulk	8.00@ 9.75
Johnson, Vt.—Ground talc (20-50 mesh), bulk	8.00
(Bags extra)	
Ground talc (150-200 mesh), bulk	8.50@15.00
(Bags extra)	
Keeler, Calif.—Ground talc (200-300 mesh), bags	18.75@32.00
(Bags extra)	
Los Angeles, Calif.—Ground talc (20-50 mesh) 200-lb. bags	12.00
Ground talc (150-200 mesh) 200-lb. bags	8.00@10.00
Natural Bridge, N. Y.—Ground talc (150-200 mesh) bags	12.00@18.00
Rochester and East Granville, Vt.—Ground talc (20-50 mesh), bulk	8.50@10.00
(Bags extra)	
Ground talc (150-200 mesh), bulk	10.00@22.00
(Bags extra)	
Vermont—Ground talc (20-50 mesh); bags	8.50@10.00
Ground talc (150-200 mesh); bags	9.00@16.00
Waterbury, Vt.—Ground talc (20-50 mesh), bulk	8.50
(Bags extra)	
Ground talc (150-200 mesh), bulk	10.00@15.00
(Bags extra)	
Pencils and steel workers' crayons, per gross	1.20@ 2.00

Roofing Slate

The following prices are per square (100 sq. ft.) for Pennsylvania Blue-Gray Roofing Slate, f.o.b. cars quarries:

Sizes	Genuine Bangor, Washington Big Bed, Franklin Big Bed	Genuine Albion	Slatington Small Bed	Genuine Bangor Ribbon
24x12	$ 9.30	$8.40	$8.10	$8.10
24x14	9.30	8.40	8.10	8.10
22x12	10.72	8.70	8.77	9.10
22x11	10.72	8.70	8.77	9.10
20x12	10.72	8.70	8.77	9.10
20x10	11.70	9.60	9.42	9.42
18x10	11.70	9.60	9.42	9.42
18x 9	11.70	9.60	9.42	9.42
16x10	11.70	9.60	9.42	9.42
16x 9	11.70	9.60	9.42	9.42
16x 8	11.70	9.60	9.42	9.42
18x12	11.05	9.30	9.10	9.10
16x12	11.05	9.30	9.10	9.10
14x10	11.05	9.30	8.77	8.77
14x 8	11.05	9.30	8.77	8.77
14x7 to 12x6	10.40	9.00	8.45	
	Mediums	Mediums	Mediums	Mediums
24x12	$ 8.10	$7.50	$7.50	$5.75
22x11	9.10	7.75	7.75	5.75
Other sizes	9.10	8.10	8.45	5.75

For less than carload lots of 20 squares or under, 10% additional charge will be made.

The following are the prices per square for slate, f.o.b. cars quarries, Granville, N. Y., the prices given in each case being for No. 1 Sea Green Roofing Slate:

22x11, 20x12, 20x11, 20x10, 18x12, 18x10, 18x9, 16x12, 16x10	10.20
24x12, 22x12, 16x9, 16x8, 14x12, 14x10	9.90
26x14, 24x14, 22x14, 20x14	9.60
14x9, 14x8, 12x10	9.00
14x7, 12x9, 12x8	8.70
12x7, 11x8, 11x7, 10x8	7.50
12x6, 10x7	7.20

Granulated slate per net ton, f. o. b. quarries, Vermont and New York, 7.50.

Special Aggregates

Prices are per ton f. o. b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco chips
Bound Brook, N. J.—Trap rock, carload lots; bulk		2.30
Deerfield, Md. — Green; bulk	7.00	7.00
Easton, Pa.—Green Marble, loose in cars	14.00	12.00
Lincoln, Neb. — Red, white, grey, in bags		30.00
Middlebrook, Mo.—Red granite; sacks	30.00@35.00	20.00@25.00
Milwaukee, Wis.		10.00@12.00
Missouri river points — Different colors	20.00@25.00	20.00@25.00
Piqua, O.—Marble	8.00@10.00	8.00@10.00
Sioux Falls and Red Granite, Wis.	7.50	7.50
Tuckahoe, N. Y.—White Marble	12.00	12.00
Crushed white stone and marble dust in 100 lb. bags	6.50@12.00	
Tate, Ga.—White limestone, sacks extra	5.00@ 7.00	5.00@ 7.00
Wausau, Wis.	14.00@18.00	
Wisconsin and S. Dak. points—Granite, different colors, bulk or sacks	1.50@ 2.00	3.00@ 7.00
Granite dust in bags	6.00	

Crushed Gypsum

Akron, N. Y.	3.50
Blue Rapids, Kan.	3.50
Castalia, O.	3.50
Centerville, Ia.	3.50@4.20
Ft. Dodge, Ia.	3.50@4.00
Grand Rapids, Mich.	3.50
Gypsumville, Man., Can.	3.50
Oakfield, N. Y.	**4.00**
Gypsum, O.	3.50
Port Clinton, O.	4.50
Rapid City, S. Dak.	5.00
Saltville, Va.	**4.50**
Winnipeg, Man., Can.	5.50

(Gypsum) Land Plaster

Akron, N. Y.	4.50
Blue Rapids, Kan.	4.50
Castalia, O.	6.00
Bags extra—Jute 3.00; ppr., 1.00.	
Centerville, Ia. (bags extra)	4.50@7.00
Ft. Dodge, Ia.	4.50
Garhutt, N. Y.—Bags extra	7.50
Grand Rapids, Mich.	4.50@7.50
Gypsum, O.	4.50
Mound House, Nev.	7.50@8.00
Sacks, .25 extra.	
Oakfield, N. Y.	7.00
Los Angeles, Calif.	12.50

Sand-Lime Brick

Prices given per 1,000 brick f. o. b. plant or nearest shipping point, unless otherwise noted.

Albany, Ga.	13.00@14.00
Barton, Wis.	14.00
Brighton, N. Y.	17.00
Buffalo, N. Y.	16.50
El Paso, Texas	14.00
Gary, Ind.	11.50@12.00
Grand Rapids, Mich.	15.00
Lancaster, N. Y.	14.50
Michigan City, Ind.	11.00
Miller, Ind.	10.00@10.50
Milwaukee, Wis. (delivered at job)	17.50
Minneapolis, Minn.	13.00
Plant City, Fla.	10.00
Portage, Wis.—Common	15.00
Face	25.00
Redfield, Mass.	15.00
Saginaw, Mich.	14.75
San Antonio, Texas—Common	16.00
Face	24.00
South Dayton, Ohio	16.50
Syracuse, N. Y. (delivered at job)	20.00
F. o. b. cars	18.50
Toronto, Can.	17.00
Washington, D. C.	14.50
Winnipeg, Can. (less $1 trade disc.)	**19.00**

Concrete Brick

Prices given per 1,000 brick, f.o.b. plant or nearest shipping point.

	Common	Face
Appleton, Minn.	18.00@20.00	28.00@36.00
Bellow Falls, Vt.	20.00	35.00
Bridgeport, Conn.	31.00	32.00
Buffalo, Niagara Falls and Rochester, N. Y.	21.00	
Eau Claire, Wis.	20.00	30.00@40.00
Houston, Tex.		22.00
Lockport, N. Y.	17.00	
Milwaukee, Wis.	17.00@18.00	35.00@65.00
Omaha, Neb.	32.00	42.00
Piqua, O.	18.00	25.00
Portland, Ore.	25.00	43.00@73.00
Fancy brick	100.00@150.00	
St. Paul, Minn.	18.00	32.00
Springfield, Ill.	18.00	20.00@25.00
Tonawanda, N. Y.	20.00	
Virden, Ill.	18.00	20.00@25.00
Winnipeg, Man., Can.	19.00	40.00

Rock Phosphate

Raw Rock

Per 2240-lb. Ton

Centerville, Tenn—B.P.L. 72% to 75%	6.00@8.50
B.P.L. 65%	8.00
Gordonsburg, Tenn.—B.P.L. 68%	6.00@7.00
B.P.L. 70% to 75%	6.00@9.00
Mt. Pleasant, Tenn.—B.P.L. 75%	8.00@9.00
Paris, Idaho.—2,000 lb. mine run, B.P.L. 70%	4.50
Wales, Tenn.—B.P.L. 70%	6.00@8.00

Ground Rock

Per 2000-lb. Ton

Centerville, Tenn.—B.P.L. 70%—90% thru 100 mesh	9.00@10.00
B.P.L 75% (brown rock)	12.00
Mt. Pleasant, Tenn — B.P.L. 68%—13% Phosphorus	7.50@9.00
14% Phosphorus	8.00
B.P.L. 65@70%	7.00@9.00
Norwills, Fla.—(Fla. Hard Rock)—B.P.L. 68%	10.00

Florida Soft Phosphate

Raw Land Pebble

Per Ton

Bartow and Norwills, Fla.—B.P.L. 50%, bulk	6.00@ 8.00
B.P.L. 78%, bulk	13.50
Jacksonville (Fla.) District	10.00@12.00

Ground Land Pebble

Per Ton

Jacksonville (Fla.) District	14.00
Add 2.50 for sacks.	
Morristown, Fla.—26% phos. acid	16.00
Lakeland, Fla.—B.P.L. 72%	13.50
B.P.L. 60%	6.00

Lime

Warehouse prices, carload lots at principal cities.

	Hydrate per Ton Finishing	Common
New York	$21.00	$19.00
Chicago	20.00	.....
St. Louis	26.00	20.00
Boston	25.25	21.25
Dallas	27.50	25.00
Cincinnati	17.60	16.60
San Francisco	25.40	22.00
Minneapolis	29.00 (white)	22.00
Denver (bbl.)	32.00	.....
Detroit	22.00	19.00
Seattle	27.00	.....
Los Angeles	30.00	30.00
Baltimore	22.25	17.50
Montreal	30.00	.....
Atlanta	22.50	18.00
New Orleans	.....	17.00
Winnipeg	.....	21.20

	Lump per 200-lb. Barrel Finishing	Common
New York	$ 3.50 at plant	$ 3.30*
Chicago	.....	1.75
St. Louis	.....	2.50*
Boston	3.50	3.25
Dallas	.....	3.00†
Cincinnati	.....	13.10‡
San Francisco	.....	2.25
Minneapolis	1.80	1.50
Denver	1.00 (bu.)	3.20
Detroit	2.00†	1.80†
Seattle	3.25	2.75
Los Angeles	3.00*	3.00*
Baltimore	.....	12.75‡
Montreal	15.00‡	.....
Atlanta	1.60	1.40
New Orleans	2.75	2.00
Winnipeg	3.20	13.80‡

*300-lb. barrels. †Per 180-lb. barrel. ‡Per ton.
NOTE—Refund of 10c per barrel.

Portland Cement

Current prices per barrel in carload lots, f. o. b. cars, without bags:

New York (del.)	$2.80
New York, alongside dock, to dealers	2.40
Jersey City (del.)	2.89
Boston	2.86
Chicago	2.17
Pittsburgh	2.17
Cleveland	2.43
Detroit	2.43
Indianapolis	2.43
Toledo	2.49
Milwaukee	2.39
Duluth	2.10
Peoria	2.45
Cedar Rapids	2.51
Davenport	2.47
St. Louis	2.60
San Francisco	3.09
New Orleans	3.36
Minneapolis	2.41
Denver	**3.10**
Seattle	3.10
Dallas	2.60
Atlanta	2.80
Cincinnati	2.57
Los Angeles	3.21
Baltimore (del.) drayload lots	3.58
Birmingham	3.05
Kansas City	2.55
Montreal	3.44
Winnipeg	3.36

NOTE—Bag charge is generally 10c each.

Natural Cement

Current price for 500 bbl. or over, f.o.b., exclusive of bags:

Minneapolis (Rosendale)	$2.80
Kansas City (Ft. Scott)	1.60
New Orleans	3.36
Atlanta (Magnolia)—ton	11.00
Boston (Rosendale)	3.00
Cincinnati (Louisville)	2.75

General Market News

Steal $1,500 Pay Roll

FOUR automobile bandits held up the paymaster of the Akron Sand and Gravel Co., Akron, Ohio, on June 25, and escaped with $1,500.

Validity of South Dakota Cement Plant Appropriation to Be Tested

AN ACTION was started in the South Dakota Supreme Court recently to test the validity of the $2,000,000 bonded indebtedness authorized to be incurred by the state cement commission in acquiring, constructing and putting into operation a state-owned cement plant at Rapid City, when Edwin A. Aekin, of Pierre, filed an application for a writ of prohibition and order to show cause.

Governor McMaster, the state treasurer, and each member of the cement commission are named as defendants.

The commission was given authority by the last legislature to begin work on a state-owned plant, which is to cost not more than $2,000,000.

Present Construction Deficit

THE most reliable figures available show that, in addition to the annual normal construction requirements, there is an accumulated construction deficit at present which amounts to the staggering total of almost $15,000,000,000, as follows: Housing, $5,000,000,000; railways, $5,000,000,000; public utilities, $1,900,000,000; highways, $2,100,000,000; miscellaneous construction, $500,000,000.

Freight Rates Lowered in Kentucky by the L. & N. R. R.

A CUT of about 25 per cent in the rates on sand, gravel and crushed stone has been announced by the Louisville and Nashville, R. R., following a conference of H. Green Garrett, of the State Highway Commission, and highway engineer, Joe S. Boggs, with A. R. Smith, third vice-president. Mr. Boggs figures a saving to the State of about $50,000 annually.

The following table gives the present rates which are retroactive to January 1, 1921:

Distance	Price per ton
0 to 10 miles	$ .60
10 to 20 miles	.70
20 to 45 miles	.80
45 to 65 miles	.90
65 to 85 miles	1.00
85 to 100 miles	1.10
100 to 125 miles	1.20
125 to 150 miles	1.30
150 to 175 miles	1.40

These rates apply on material for highway work only.

Spending Illinois' Highway Appropriations

THE FOLLOWING significant dispatch went out from Springfield, Ill., on June 29:

"Governor Small has signed the cement plant bill, which sets aside $5,000,000 of the road fund for a cement plant and lands containing road building materials."

Los Angeles Cement Plant May Be Sold

NEGOTIATIONS now under way between the Los Angeles, Calif., Board of Public Service Commissioners and the U. S. Potash Co. may result in the sale of the cement plant at Monolith, Calif., according to a local newspaper.

A price of $450,000 for the plant has been mentioned. The U. S. Potash Co. now operates the plant under a five-year lease from the city. The board is considering the advisability of disposing of the plant if a suitable purchase price can be agreed upon.

The city built and operated the Monolith plant during the building of the aqueduct. It was idle for a long period afterward and was finally leased to the U. S. Potash Co. in August, 1920.

Fountain Sand and Gravel Co., Pueblo, Colo., Caught in Colorado Flood Disaster

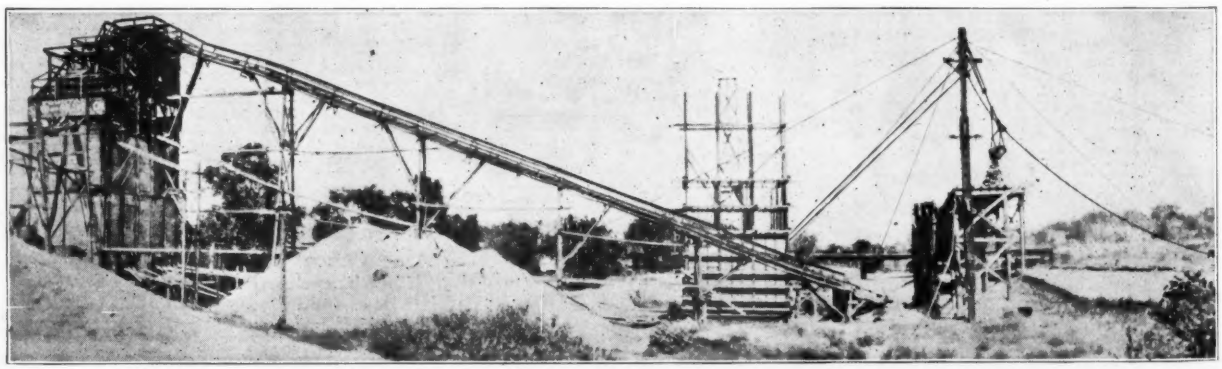
THE Fountain Sand and Gravel Co., Pueblo, Colo., whose plant is located on the Fountain River, about one mile above the mouth of the river, where it flows into the Arkansas River, was partly damaged by the flood which resulted in such a great loss of life and destruction of property in the region around Pueblo, the second largest city in the state of Colorado.

In a communication from J. A. Bullen, general manager of the company, ROCK PRODUCTS is informed that as a result of the flood the company's bucket and cable line has been buried in the sand and that their electric hoist used for operating the dragline excavator has been washed into the river.

A steel bridge, 600 ft. long, located about 200 yds. from the plant, was washed out under its foundations and at the present time is buried in the sand pit opposite the plant.

The plant consists of a 1-yd. Sauerman dragline excavator with a capacity of 400 yds. per day. The material is elevated to the top of the bins and from here it passes through a series of Mitchell electric vibrating screens and thence to the bins from which the cars are loaded.

This plant is probably the only sand and gravel plant that is using electric vibrating screens for sizing wet material. The company had recently installed a series of three electric vibrating screens in their new plant.



Plant of the Fountain Sand and Gravel Co., Pueblo, Colo., partly destroyed in recent disastrous flood

News of the Industry

Incorporations

The **Little Piney Sand and Gravel Co.**, Newburg, Mo., has been incorporated for $20,000.

The **Progressive Cement and Tile Sales Corp.**, Dover, Del., has been incorporated for $100,000 to manufacture concrete products of all kinds.

The **American Asphalt Co.**, Boston, Mass., has been incorporated by Michael Meehan, president; David W. Murray, 14 Dana Ave., treasurer, and S. E. Duffin.

The **Red Bud Quarry Co.**, Red Bud, Mo., has been incorporated for $5,000 by G. H. Becker, A. C. Schrieber, August Eggerding, J. F. Faust and Henry Schifferdecker.

The **Phosphate Products Co.**, Mt. Pleasant, Tenn., has been incorporated for $25,000 by E. E. Fisher, N. B. Stewart, Dan Carter, R. W. Victor and F. M. Rickets.

The **Peekskill Creek Gravel Corporation, Inc.**, Peekskill, N. Y., has been incorporated for $200,000 by J. M. Clark, East Orange, N. J.; R. D. Harvey, New York City and James Marshall, South Orange, N. J.

The **Penn Shope Brick Co.**, Reading, Penn., has been incorporated for $50,000 by L. H. Rothrauff, H. R. Brenneman, F. E. Wert, A. F. Kostenbader and C. A. Smith to manufacture and deal in concrete brick and other concrete products.

The **Valley Marl and Lime Corp.**, Roanoke, Va., has been incorporated for $100,000 by C. S. Schubert, president; H. P. Coffey, secretary and M. M. Caldwell, all of Roanoke. The company will deal in marl and limestone.

The **Central Sand and Gravel Co.**, Des Moines, Ia., has been incorporated for $50,000 by W. R. Gibson, president; H. L. Gross, vice-president; C. W. Layman, secretary, and J. H. Gibson, treasurer, all of Des Moines.

C. Ernest Hill, Inc., Boston, Mass., has been incorporated for $50,000 by Chas. Hill, president; C. Ernest Hill, 3 Ransom Road, Newton Centre, treasurer, and J. A. Hill. The company deals in all kinds of building materials.

The **Decorah Stone Products Co.**, Decorah, Ia., has been incorporated for $25,000 by E. F. Sellman, president; W. B. Reed, vcie-president, and Richard Bucknell, Sr., secretary-treasurer, all of Decorah. The company will deal in sand, gravel and stone.

Quarries

The **Stone Products Co.**, Bedford, Ind., has filed a preliminary certificate of dissolution with the secretary of state at Indianapolis.

The **Columbia Contract Co.**, St. Helena, Ore., has been compelled to close its quarry due to high waters in the Columbia river.

The **France Stone Co.**, Toledo, Ohio, has opened its quarry at Dunkirk, O., after an eight months' shut-down. About 25 men are now employed at the quarry.

The **North Carolina State Highway Commission**, Raleigh, N. C., will erect two rock crushing plants in the state at a total cost of about $200,000.

Yreka, Calif.—Mining claims to the number of 24 were located recently by a company composed chiefly of Weed, Calif., men. These locations claim the ground is valuable for the deposits of diatomaceous earth or kieselguhr.

The Minor Quarry, Warren Creek, Calif., has resumed operations after a shut-down of about five weeks. The shut-down was caused by landslides from the heavy storms during April. The quarry is furnishing stone for jetty work.

Versailles, Ind.—The limestone quarries at Nestwood opened a few days ago. They have been closed down for the past two years or more and it is expected that they will operate steadily during the next few months.

Hopkinsville, Ky.—Most of the large stone quarries of Christien and Hopkins counties are in operation and business has been very good this season. A great many men are employed in this industry in the two counties.

The **Coast Rock and Gravel Co.**, Oroville, Calif., is working double shifts with 50 men on its payroll in order to take care of the demand for crushed rock. During the week ending May 28 the company shipped 400 carloads of rock from Oroville.

The **Chickamauga Quarry and Construction Co.**, Chattanooga, Tenn., with quarries located at Chickamauga reports that business in that locality is good so far this year and that it is likely to continue so. Crushed stone in this locality is used mainly in street and road work.

The **Tri-City Stone Co.**, Benton, Mo., is making the necessary preparations for the installation of a stone crusher and limestone pulverizer at its quarry north of Ancell, and will shortly be prepared to furnish a better grade of crushed rock as well as supply the farmers with limestone for fertilizer.

Johnson & Rhodes Co., Walton, N. Y., and other quarry owners in Delaware County have reopened their blue stone quarries. These quarries have been closed since 1918 on account of the high production costs and small demand for blue stone. The stone is used for sidewalk and curb work.

The **Deschambault Quarry Co.**, 52 St. Paul St., Quebec, Can., recently submitted a sample of its limestone to chemists at Montreal for analysis and found that it contained a high per cent of lime. The company is considering the manufacture of limestone dust to be used as a filler in asphalt mixtures.

The **Buckeye Stone Co.**, Dallas, Texas, announces that its plant located about seven miles south of Corsicana, Texas, will be operating soon. According to W. V. Cullen, president of the company, the Southern Pacific Railroad has contracted for 75 per cent of the total output and has built a five-mile spur from its main line to connect with the quarry.

Barre, Vt.—The quarry workers of Barre have rejected the proposed reduction of wages (8 cents for skilled and 13 cents for unskilled labor) as reported by a recent conference in Boston, the vote standing 18 in favor to 180 against acceptance. The vote was taken at a special meeting of Branch No. 12, Quarry Workers' International Union of North America at Graniteville, Vt.

The **L. D. Smith Stone Co.**, Sturgeon Bay, Wis., did a $50,000 stone business during the month of May, breaking all previous records. Of this amount $15,000 was paid to chartered boats, the steamers Henipen and Hydro. The company is delivering stone at ports on both the east and west side of Lake Michigan and at ports on Green Bay. Daily shipments of stone are going out of the quarry by boat.

The **Bell Marble Co.**, Columbia, Calif., has begun the expenditure of a large sum of money in improving the equipment of its plant. The improvements in the equipment will enable the company to more than double the output of the quarry. The marble classed as waste has been contracted for by the Pacific Lime and Plaster Co., whose large quarry, kilns and grinding plant are situated one mile south of Sonora, Calif.

Blue granite has been found in an Asheville, N. Car., quarry, according to a local newspaper, which is equal in quality to the famous Vermont product. A block of the granite is being prepared and will soon be on exhibition in the yard of a local dealer in marble and granite. The quarry is owned by W. A. Smith and at the present time is getting out about 25 perch of stone and 40 cu. yds. of crushed stone.

The **Salida Granite Corp.**, Salida, Colo., has located a deposit of red granite on Texas Creek about 30 miles east of Salida. The company has taken up 160 acres of the choicest deposit, in which is found a variety of shades in the red granite. The texture is fine and free from all foreign minerals which make so much of the granite deposits useless for monumental purposes. A force of men is already at work opening a quarry, and soon there will be a regular shipment from the Texas Creek plant.

Sand and Gravel

David G. Edwards and F. B. Currier, Long Branch, N. J., will form a corporation shortly to deal in sand, gravel and crushed stone.

The **Stillwell Sand and Gravel Co.**, Anderson, Ind., has announced an increase in capital stock from $100,000 to $150,000.

The **Marlborough Sand and Gravel Co.**, Marlborough, N. Y., has recently signed a contract with the Fred T. Ley Co., for 30,000 cu. yds. of gravel for road work.

The **Maco Company**, Milwaukee, Wis., has increased its capitalization from $25,000 to $50,000. Theo. Martin is president of the company which manufacturers and deals in building materials.

The **Carolina Sand and Gravel Co.**, Carthage, Mo., has sold its holdings near carthage to the Geo. A. Fuller Construction Co., New York. The new owners plan to add additional equipment to increase the output of sand and gravel.

The **Federal Sand and Gravel Co.**, Rockford, Ill., has bought 13½ acres of land located near South Beloit, Wis., from E. A. Howard, of Beloit, Wis. The company plans to locate a sand and gravel pit on the property.

The **Kedzie Sand and Gravel Co.**, 11055 South Michigan Ave., Chicago, Ill., recently organized to operate a pit at 119th St. and Kedzie Ave. will not operate on a large scale according to S. Van Etten, an officer of the company. The deposit on examination was found to be too small to warrant any large investment.

Wichita, Kan.—The rise of the Big Arkansas River, which is the principal source of Wichita's building sand, is responsible for a shortage of this essential material. A great deal of construction work is held up due to this sand shortage. It will be weeks, it is believed, before the river falls to a point where the sand boats and wagons will be able to scoop sand out of the river bed.

Cement

The **Nebraska Cement Co.**, Denver, Colo., is operating its plant at Superior, Nebr., at capacity. The company has recently completed several bungalows for its workers.

The **Canada Cement Co.**, Montreal, Can., is to erect a new office building 120 ft. by 165 ft. Reinforced concrete construction will be used. The frontage on Phillips Square will be of hard-tooled cast granite stone made by the Benedict Stone Corp. and the south wall and courts will be lined with Hydrostone made by Canadian Hydrostone Limited.

The **Bessemer Limestone & Cement Co.**, Bessemer, Penn., recently shipped 4,400 barrels of cement, one of the largest movements thus far made in any day. The cement plant is operating practically to the rated 3,000 barrel daily capacity with prospects that it may reach 4,000 barrels. The company is booked to capacity for about four months and has additional business in sight virtually assuring it capacity operation for the balance of the year, says an official.

Sale Lake City, Utah.—Acquisition of the Eagle Rock cement properties in Parley's Canyon from the Seymour B. Young interests by William Rook and associates has been announced. The properties acquired by Mr. Rook aggregate upward of 100 acres, including the peak formation known as Eagle Rock, which is said to be a virtual mountain of cement. The best rock there averages 86 per cent pure cement, according to analyses made. Plans for the development of this property will include the erection, probably beginning in the fall, of a modern plant which, when completed, will represent an outlay of approximately $300,000.

Lime

The **Cornwall Lime Marl Co.**, of which John J. Cornwall is president, will establish a plant in Winchester, Va. C. J. Swank is in charge.

The **Harbor Brick Co.**, Toronto, Ont., will erect a new plant at Ashbridge's Bay on the harbor front and resume the manufacture of sand-lime brick.

The **Templeton Limestone Co.**, Kittanning, Pa., plant was completely destroyed by fire on June 23. The company is in the market for conveyor, bin, belting, engine, etc., equipment, according to Harry T. Wolf of the company.

Clarence A. Wolle, Bethlehem, Pa., is part owner of a large lime property located in Orange County, N. Y., on which it is proposed to erect a lime and hydrating plant as soon as the money market becomes more stable. The property is about 75 miles from New York City.

Easton, Md.—The lime kiln at the plant of William H. Valliant, Bellevue, near Easton, was

destroyed recently by fire. Other portions of the plant, devoted to affiliated manufacture, were also destroyed, with total loss estimated at about $200,000 with machinery.

Phosphate

The Montana Phosphate Co., Maxville, Mont., has established general headquarters in Spokane, Wash., in the Peyton Building. The Spokane offices will be operated from the headquarters at Maxville, according to F. J. Russell, president of the company. The company also expects to open a branch office in Seattle, Wash. Construction of a plant at Maxville at an approximate cost of $100,000 is now planned and development on a large scale making foreign shipments possible will begin soon.

The Anaconda Copper Co., of Butte, Mont., which recently acquired about 2,500 acres of proven Idaho phosphate field at an investment of several hundred thousand dollars, is planning for the erection of a milling plant of 3,000 tons daily capacity. The machinery for the first 750-ton crushing and drying unit is now on the ground, as is also the material for a 3,000-ton bin and a 1,000-cubic foot capacity air compressor plant for the underground development. A power line has already been installed, originating at one of the hydro-electric plants of the Utah Power and Light Co. on Bear River Canyon. It is expected that this installation will ultimately develop into the largest single unit of mineral fertilizer production in the United States.

Gypsum

The Ralph Gypsum Co., Akron, N. Y., has increased its capitalization from $200,000 to $1,500,000.

The Imperial Gypsum and Oil Co., San Diego, Calif., held a meeting recently and elected the following officers: Former Congressman Kettner, president; H. G. Hotchkiss, secretary, and Fred Heilbron, treasurer. The directors elected were: J. S. Young, J. S. La Sha, J. J. Abrahamson, Theodore McLaughlin, and Samuel Dunaway. Development of the company's property will continue; machinery is already on the grounds, and will be installed soon. The problem of getting transportation is being solved, and the industry will be soon under way, according to General Manager Dunaway.

Concrete Products

The Zagelmeyer Cast Stone Block Co., Toledo, Ohio, has increased its capitalization from $20,000 to $75,000.

The Heim Cement Products Co., North Liberty, Ind., has changed its name to North Liberty Silo and Concrete Co.

The Interlocking Holloway Cement Brick Co., Venice, Calif., is now in full operation manufacturing concrete brick. Joseph Hefele and F. O. Spencer are the owners of the plant.

The Concrete Products Co., a subsidiary of the Concrete Steel Co., New York City, has established an office in Oklahoma City, Okla., in the Tradesman's National Bank Bldg. E. A. Cahill is in charge of the office.

The Central Wisconsin Concrete Brick Manufacturing Co., Stevens Point, Wis., started operating in May and is now manufacturing about 3,000 brick a day. The company's plant has a capacity of from 10,000 to 15,000 brick per day due to the addition of five brick machines. The bricks are made by the Shope process.

Manufacturers

The Ilg Electric Ventilating Co., Chicago, Ill., has just issued literature on the use of its heating and ventilating machinery in industrial plants.

The Good Roads Mfg. Co., Philadelphia, Pa., has moved its general sales office from 821 Bulletin Building, Philadelphia, to Kennett Square, Pa.

The Pawling and Harnischfeger Co., Milwaukee, Wis., has just issued Bulletin 6X describing its P. & H. Excavator-Crane No. 206. This crane is a full revolving, all corduroy portable crane and excavator.

The Webster Mfg. Co., Chicago, Ill., has issued its magazine, Webster Method, for June and among other things it contains an article on the installation of Webster equipment in the new Oklahoma Portland Cement Co.'s plant at Ada, Okla.

The Austin Manufacturing Co., Chicago, Ill., has just issued catalog F entitled "Austin Rollers" describing the company's product of motor and steam road rollers and scarifiers. The catalog is attractive and describes the rollers in detail both as to manufacture and use.

The B. F. Sturtevant Co., Hyde Park, Boston, Mass., has just issued catalog No. 278 entitled "Air Conditioning Apparatus." The catalog contains descriptions of Sturtevant installations of air conditioning apparatus and much valuable text regarding the science of regulating air conditions in factories and other buildings.

The Taylor-Wharton Iron and Steel Co., High Bridge, N. J., manufacturer of "Tisco" steel products, has issued catalogs on "Rotary Pulverizer Parts," "Gears and Pinions," and "Chains, Sprockets and Conveyor Parts." Other catalogs of interest are "Panama Dipper Teeth," "Repair Parts for Quarry and Crushing Machinery," "Steam Shovel and Dredge Parts."

"Industrias y Construcciones," a limited company, has been organized at Guayaquil, Ecuador, with a capital of 300,000 sucres (the Ecuadorian sucre at present exchange is fluctuating between $0.25 and $0.27 United States currency). Preparations are being made by the company for the installation of a plant with a capacity of 60,000 barrels of cement annually. American manufacturers are requested to send catalogs of cement-making machinery, and notice is given that the machinery selected will be purchased for cash at a fixed rate of exchange that is to be agreed upon. The technical director of the company is an American and prefers to buy the machinery in the United States, where he expects soon to make a visit in the interests of his company. (The name and address of the contractor may be obtained from the bureau or the district and cooperative offices by referring to File No. 29367.) —"Commerce Reports," U. S. Department of Commerce.

Classified Advertising

Rates for advertising in the Classified Department: $2.50 per column inch per insertion. Minimum charge, $2.50. Please send check with your order. These ads must be paid in advance of insertion.

Help Wanted

WANTED

Lime Kiln Fireman. Must be experienced in burning of lime in hand fire kilns. State experience, salary and references.

Address

Box 1493 **Care of Rock Products**

Superintendent Wanted

For small lime manufacturing plant. Must be experienced and have thorough knowledge of quarrying and burning of lime. State experience, salary and references in first letter. Address

Box 1492 **Care of Rock Products**

Situations Wanted

SUPERINTENDENT

Desires engagement; twenty years' experience; thoroughly familiar with heavy production and steam shovel operation, crushing plants and gravel plants. References. Address

Box 1489 **Care Rock Products**

Situations Wanted

Position Wanted

Quarry or lime plant superintendent or manager, 36 years of age. Experienced in large operations.

Will consider position or invest in going concern needing experienced man with capital.

References exchanged.

Location no object but proposition must have merit and future. Address

Box 1491 **Care Rock Products**

Situations Wanted

Engineer Available

Exceptional Experience Grinding and Preparation of Industrial Rock Products

Barytes, Feldspar, Carbons, Mica, Flint, Calcite, Whiting, Graphite.

Part or Whole Time

Address Box 1000, Rock Products, 101 West 41st Street, New York, N. Y.

Have you a plant for sale? Do you wish to purchase a plant? Are you in need of a superintendent or manager? Are you looking for a position as plant superintendent or manager? Advertise your wants in these columns for quick results.

Used Equipment

Rates for advertising in the Used Equipment Department: $2.50 per column inch per insertion. Minimum charge, $2.50. please send check with your order. These ads must be paid in advance of insertion.

Repaired Contractors' Equipment

Steam Shovels

Model 60 Marion Shovels, 2½-yard dippers, Nos. 1999, 2059, 2130

1—Model 1 Thew, on railroad trucks, ⅞-yard dipper.

1—Bucyrus Model 70-C, Shop No. 1219.

2—Model 28 Marion Revolving, ⅝-yard dippers.
1—Model O Thew Revolving, ½-yard dippers.
1—Type "B" Erie Revolving, ¾-yard dippers.

We have a large stock of thoroughly repaired Construction Equipment of all kinds ready for immediate shipment.

Locomotives

8—18-ton, 10x16" Porter Dinkeys, 36" gauge.
2—12-ton, 9x14" Porter Dinkeys, 36" gauge.
1—17x24", 55-ton, 4-6-0, standard gauge.
3—25-ton Forney type.

Clam Shell Buckets

1—1¼-yard Williams Hercules Bucket.

Cars

30—Western Air Dump 12-yard, standard gauge.
40—Western 4-yard, 36" gauge, steel beam.

H. KLEINHANS COMPANY
Union Arcade **Pittsburgh, Pa.**

NO. 8-D, GATES GYRATORY CRUSHER

STANDARD DRIVE

Fitted with manganese head and concaves. Included with this crusher, we have the following extra spare parts:

1 New, Manganese head.
1 New, set of manganese concaves.
1 New, main shaft.
1 New, Spider, and 2 New, eccentrics.

We also have many other sizes and types. We specialize in good quarry equipment of all classes. Write us fully.

Reading Engineering Co., Inc.
1227 Tribune Bldg., New York, N. Y.

Machinery For Sale

DRYERS—Direct-heat rotary dryers, 3x25', 3½x25', 4x30', 5½x50' 6x50' and 7x60'; double shell dryers, 4x20', 5x30' and 6x35'; steam-heated air rotary dryers, 4x30' and 6x30'.

KILNS—Rotary kilns, 3½x25', 5x60' and 6x70', 6x100', 7x80' and 8x110'.

MILLS—6x8', 6x5', 2½x3" 3x3½' pebble and ball mills; 8x4', 6x4' and 4x4' continuous ball mills; 3' March mill; 42", 33" and 24" Fuller-Lehigh mills; **4½x20', 5x11', 5x20', 5½x22' and** 6x20' tube mills; 7½x13", 9x15", 16x10" and 30x60" jaw crushers; one "Infant" No. 00, No. 0, No. 2, No. 3, and No. 9 Williams' swing hammer mills; **one Kent type "G" mill; 36" and** 40" cage mills; 3' and 4½' Hardinge mills; 18x12", 20x12" and 30x10" roll crushers; No. 0, No. 1 and No. 3 Sturtevant rotary crushers; one **No. 2 Sturtevant ring roll crusher; 3 roll and** No. 000, No. 00 and No. 0 Raymond mills; one No. 5 Telsmith breaker; one 36" Sturtevant emery mill; one 3 roll Griffin mill; 60" chaser mill.

SPECIALS—Five automatic package weighing machines; jigs; one keystone excavator; 6x8', 6x5' and 4x3' Newaygo vibrating screens, **Richardson automatic scales.**

Air compressors and tanks.

W. P. Heineken, Engineer
95 Liberty Street, New York. Tel. Cortland 1841

One 50-ton, standard gauge Baldwin Mogul; 170 lbs. pressure.
One 56-ton, standard gauge American 10-wheeler; 175 lbs. pressure.
Two 50-ton, standard gauge Brooks 6-wheel switchers; 160 lbs. pressure.
One 42-ton, standard gauge Shay geared locomotive.
One 24-ton, standard gauge Shay geared locomotive.
One 14-ton, 36" gauge American Saddle Tank.
Two 23-ton, brand new 36" gauge Porter 6-wheel switchers; separate tenders.
One Model 14-B Bucyrus Shovel.

The above are only a few items of our stock. Will gladly send you our complete stock lists.

Birmingham Rail & Locomotive Co.
Birmingham, Ala.

Crushing and Grinding Machinery

1—No. 8 Gates Gyratory Crusher.
1—No. 5 Gates Gyratory Crusher.
6—Blake Type Jaw Crushers.
8—Sets Cornish Crushing Rolls.
1—Set 36"x14" High-Speed Rolls.
1—42" Fuller-Lehigh Pulverizer.
1—No. 3 Williams Crusher & Pulverizer.
2—No. 4 Williams Universal Mills.
1—Portable Crushing Plant.

Power Equipment, Etc.

12—Steam Engines—6 to 300 HP.
10—Steam Boilers—10 to 180 HP.
12—Steam Hoists.
20—Steam Pumps.
6—Large Blowers—Sirocco and Garden City.
25—Air Drills—Sullivan, Ingersoll, Wood and McKiernan.
8—Steel Elevators, complete.
500 ft. Steel Screw Conveyors.

The Machinery & Supply Corp.
Joplin, Missouri

New—RAILS—Relaying

All sections on hand for quick shipment. Reasonable prices quoted. Our stock is very complete.

M. K. FRANK
Frick Building Pittsburgh, Pa.

FOR SALE

9x16" Climax Jaw Crusher.
No. 2 Style D Gates Gyratory Crusher.
75 H. P. 13x16" Erie Steam Engine.
125 H. P. 18x24" Atlas Steam Engine.
12x12" Lidgerwood Standard, Double Cylinder 2 Drum Cableway Engine.
600 lineal feet 1¾" Roebling Wire Cable.
100 H. P. Motor and 100 K. W. Generator. Both 550 volts and 60 cycles.

E. W. Cooper, 174 3rd Ave. No., Nashville, Tenn.

SEVERAL BELT BARGAINS

98 ft. 24" 4-ply Rubber-Covered Conveyor Belting, slightly used.....$1.50 per foot
100 ft. 30" 8-ply Canvas-Stitched Belting, slightly used.....$1.62 per foot

NATIONAL BELTING AND SALVAGE CO.
268 East Water St., Milwaukee, Wisconsin

"Everything for the Quarry"

3-ton Plymouth 4'x8½" gauge Gasoline Locomotive.
10x16 cyl. 36-in. gauge Porter Saddle Tank.
9x14 cyl. 36-in. gauge Vulcan Saddle Tank.
7x12 cyl. 36-in. gauge Davenport Saddle Tank.
⅝-yd. Thew "O" Traction Shovel.
10—24-in. gauge 1½-yd. Western Dump Cars.
6—3-yd. Koppel 36-in. gauge Dump Cars.
15—36-in. gauge 4-yd. Western Dump Cars.
3—16-yd Western Air Dump Cars.
33-in. R. H. Lehigh Fuller Mills.
7x10 and 8x10 D.C. D.D. Hoisting Engines.
Rails, Track Material, Steam Shovels, Tanks

ZELNICKER IN ST. LOUIS
Send for bargain list—Bulletin 290

Immediate Delivery

6, 7½, 9, 10 and 18 K Crushers

18 K ANGLE DR. $11,000.00.
No. 4 GYRATORY CRUSHING PLANT, N. Y.
No. 36 DISC CRUSHER, MANG. FITTED.
2—150-Hp. 125-lb. Marine type boilers and others.
No. 10 McCULLY—BARGAIN, $6,750.00.
4 No. 6 Gates (Mang. Fit.) nickel steel shafts.
50- and 75-Hp. single drum hoists for motor drive.
No. 2, 3 and 4 Gates, reg. drive crushers.
Air Compressors (steam-belt) 50 to 4000 ft.
5, 6 and 12 ton, 24-in. gauge gasoline locomotives.
1—8x8 and 10x10 Air Comp. (belt).
2—180-ft. Quick Shift, 30-ft. bucket towers.
6-in., 8-in. and 10-in. SAND PUMPS.
25—40-Hp. Thomas D. D. Elec. Hoist, 440 V. A. C.
5,- 10- and 15-ton HOLT TRACTORS, PRAC. NEW.
1, 2 and 3 DRUM STEAM AND ELEC. HOISTS.
Send us your inquiries—Sand Pumps, Motors, Contractors' Equipment, etc.

ROSS POWER EQUIP. COMPANY
Indianapolis, Ind.

Steam Shovel for Sale

Thew, Type "O," ⅝-yd. dipper, full revolving, traction wheels, overhauled, painted, new tubes in boiler, first class operating condition. Price $3500 F. O. B. Campbell, York Co., Pa. Subject to prior sale.

YORK VALLEY LIME & STONE CO.
YORK, PA.

FOR SALE

One Byers Auto Gasoline Crane, ¾ yard Clam Shell Bucket, practically new. Attractive price.

BOOTH & OLSON, Inc.
Sioux City, Iowa

Two Sauerman Draglines

Have just released two outfits, a 1¼ cu. yd. and a 1½ cu. yd., complete, with hoists, boilers, pumps, pipeing, cables, settling tanks, etc. Full details and prices furnished on request.

THE UNDERWOOD-WALKER CO.
1822 Jefferson Bank Bldg. Birmingham, Ala.

Locomotives for Rent and Sale

2—32-ton Vulcan four-driver saddle-tank, used sixty days, built March, 1921.
1—40-ton 17x24" four-wheel switcher.
2—50-ton 18x24" six-wheel switchers.
2—NEW 25-ton six-wheel Porters, separate tenders, 36" gauge.
2—18, 14, and 10-ton Vulcans, 36" gauge.

MISCELLANEOUS

13—6-yd. rebuilt dump cars, std. gauge.
20—12-yd. Westerns, like new, std. gauge.
50—60,000-lb. capacity flat and box cars.
1—Western standard gauge spreader.
1—Osgood 18 revolving shovel, traction wheels, No. 794.
1—Marion 36 steam shovel on traction wheels.
1—Marion 76 steam shovel, No. 3503, std. gauge.
2-in., 4-in., and 6-in. simple, duplex, and centrifugal pumps, new 3-drum hoists, road rollers, and tripod drills.

Locomotive-Cranes, Railway Equipment, etc.

INDUSTRIAL EQUIPMENT CO.
McCormick Building, Chicago, Ill.

New Rubber Belting

300 ft. 12" 6-ply	$0.99	per foot
423 ft. 14" 5-ply	1.04	per foot
527 ft. 14" 6-ply	1.25	per foot
529 ft. 16" 6-ply	1.39	per foot
520 ft. 16" 8-ply	1.90	per foot
150 ft. 18" 6-ply	1.48	per foot
512 ft. 18" 8-ply	2.00	per foot
216 ft. 24" 8-ply	3.15	per foot

Rolls Cut to Any Length

National Belting and Salvage Company
268 East Water Street Milwaukee, Wis.

FOR SALE

No. 7½ McCully Crusher fitted with Manganese steel head and concaves. Practically new. Crushed less than 500 tons stone. Location Canada.

HERBERT GIVIN CO.
50 Church St. New York City

FOR SALE

No. 8 Type "K" Gyratory Crusher.
Extra set of concaves and driving pinion.
Bargain. Address

BUCKEYE STONE CO.
Slaughter Building Dallas, Texas

PRODUCERS—Keep your eyes on the Used Equipment pages of
ROCK PRODUCTS
for your requirements of second hand machinery

Machinery Men—Advertise your equipment here for quick turnover

ARNOLD & WEIGEL

CONTRACTORS AND ENGINEERS
WOODVILLE, OHIO

Specializing in

The Design of Modern Lime Calcining and Hydrating Plants

ALDEN, WILTERDING & SCOTT
CONSULTING ENGINEERS
Seven-Sixty Spitzer Building
TOLEDO OHIO

COMPLETE DESIGNS

Sand and Gravel Plants, Stone Crushing Plants, Conveying and Storage Systems. Hydraulic Dredging and Stripping Plants. Power Plants and Electric Transmission.

WRITE FOR OUR CAR LOADING CHART

TERRY

FAMOUS DERRICK IRONS, FITTINGS AND ERECTORS' TOOLS

FULL CIRCLE CRANES. "EQUIPMENT THAT LASTS." TIMBER & STEEL DERRICKS

LET US SOLVE YOUR MATERIAL HANDLING PROBLEMS.

All Types of

Steel and Timber DERRICKS **TERRY**

Perforated Metal Screens

FOR EVERY PURPOSE

We make a specialty of screens for Rock, Gravel and Sand

Diamond Manufacturing Company

Wyoming, Pennsylvania

SAUERMAN DRAGLINE CABLEWAY EXCAVATORS

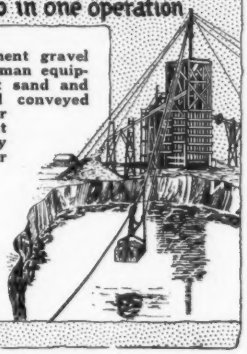
dig, convey, elevate and dump in one operation

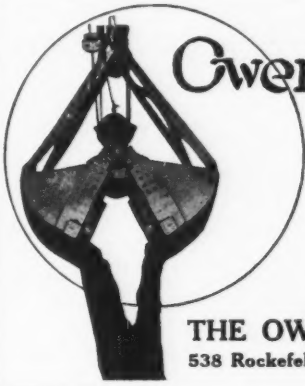
Cost data furnished by prominent gravel producers who are using Sauerman equipment backs up our claim that sand and gravel can be excavated and conveyed from pit to plant by one of our drag-line cableway excavators at a lower cost per ton than by using any other equipment or combination of equipment.

Write for Catalog No. 7

Sauerman Bros.
1140 Monadnock Bldg.
Chicago

Also Mfrs. of Power Scrapers





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combine dollar-saving features of bucket construction which are illustrated in our latest catalogue.

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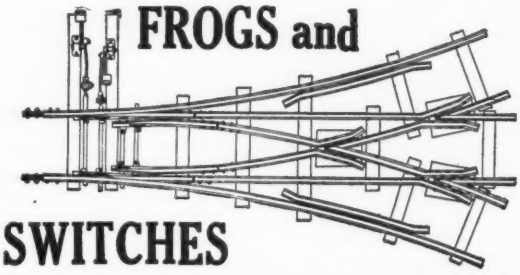

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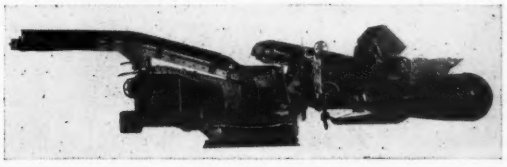

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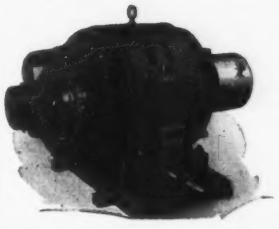

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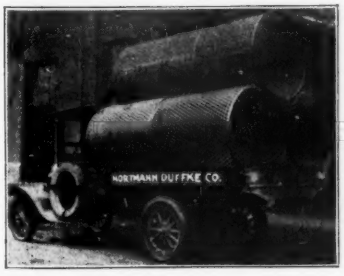

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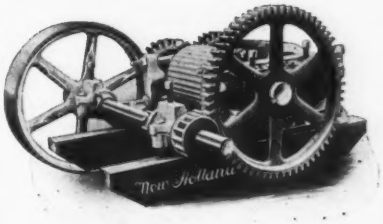

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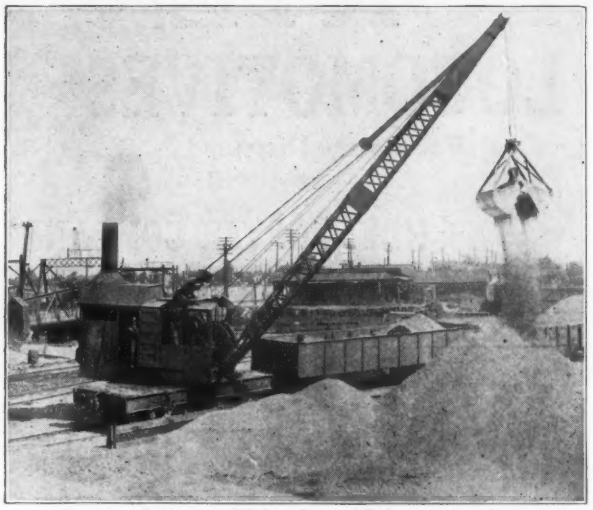

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This crane has proven to the satisfaction of a large number of owners that the heavier crane is the cheapest one to buy for some classes of service.
The Type "J" is only one of a large number of cranes manufactured by this Company.
We also manufacture a complete line of clamshell buckets.

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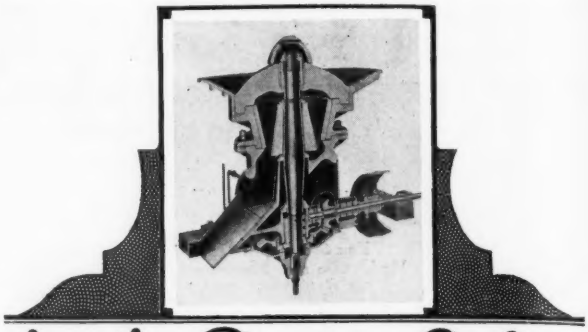

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Stationary and Portable Types

Strength to stand up under severe shocks and strains, day after day and year after year—ability to turn out the greatest amount of work with the least expenditure of time and power—that is what makes a crusher efficient.
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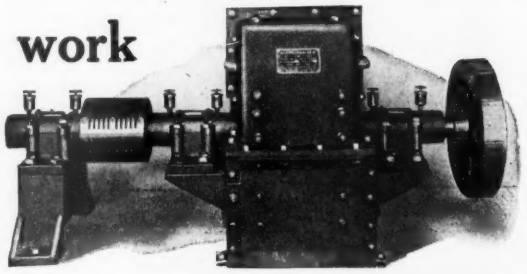
Only STEEL will stand the stress
"K-B" is built ALL-Steel



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A KRITZER plant, scientifically adapted to your conditions, will give you the best product at lowest cost

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The biggest value for your money. Universal crushers and pulverizers reduce stone to desired size or fineness in a jiffy! Fifteen years of designing and building experience have made possible the exceptional ability of Universals.

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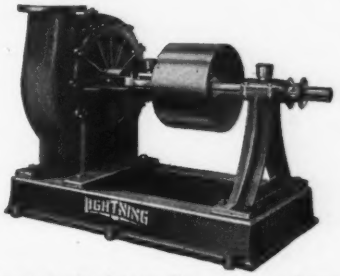
The Lightning Sand Pump

Is No Loafer!

Operate like a flash! Adjusts in a flash! Parts replaced like a flash!



The life of the Lightning Pump is one long, unbroken streak of production.

Simple in design and construction.
Drum removable and adjustable to any position.
Drum plate quickly removable.
Ball thrust bearings, front and rear.
Chilled bumper in sand drum provides long wear.
Bumper quickly replaced.
Detailed description with prices on application.

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Manufactured in sizes ranging from 7 to 60 tons capacity. 7 and 12 ton sizes may be mounted upon either railroad wheels, crawling treads or traction wheels and equipped to handle clam shell, orange peel or scraper type bucket and electro magnet.

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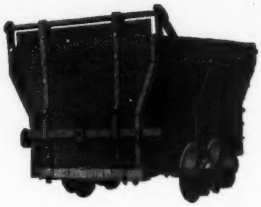

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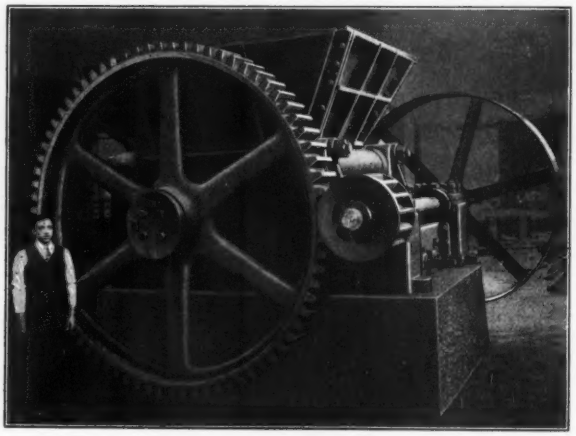

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After many years' practical experience building and operating other crushers, we brought out the first Single Roll Crusher, proved it best, simplest and most economical—making least fines—requires but little head room—no apron or hand feeding—takes wet or slimy material.

Capacity, 5 to 500 Tons Per Hour

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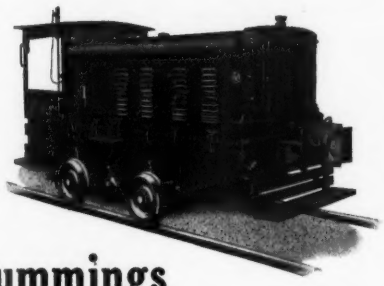
Screens, Elevators, Conveyors, Rock Washers, Etc.



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are built to deliver maximum power and service at a minimum maintenance and operating expense.

Ruggedly constructed—all parts easily accessible—easy and comfortable to operate—all sizes friction disc driven—these are a few of the many reasons why CUMMINGS Gasoline Locomotives should be a part of your road building equipment.

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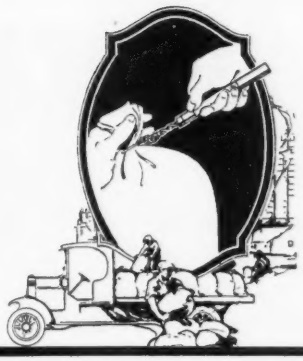

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The Bates Free Trial Bag Tying outfit, containing one Bates Spring Return Tying Tool and 10 each of 4, 4½, 5, 5½ and 6-inch Bates Wire Ties will be sent you, on receipt of your signed agreement to try this Bag Tying Outfit on your work, and then, within fifteen days, send $4.00 for the outfit or return the tool to us. These ties cost you nothing.

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WHEN you are selecting a steam shovel, you can make absolutely sure that you buy a reliable machine. Inquire of men who have used different steam shovels in ***severe rock work.***

Find out which shovel has given steadiest service in granite, trap, limestone and flint.

You will surely select the one make of shovel that is noted among quarrymen for "Steadiest service; Fewest repairs."

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Builders of ERIE Steam Shovels and Locomotive Cranes

ERIE Revolving Shovels BALL Engine Co. Erie, Pa.

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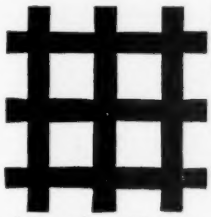
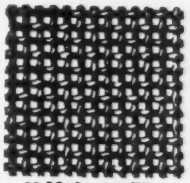


A uniform fineness is assured by the use of "Cleveland" Double Crimped Wire Cloth, making it unequalled for the screening of Sand, Gravel, Crushed Stone and Cement. "Service" is the definite policy of this organization, and through every phase of manufacture this end is constantly before us.

A large stock always on hand. However, any special mesh will be manufactured to suit requirements. PRICES RIGHT



2½ mesh; .105 wire

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PERFORATED STEEL SCREENS

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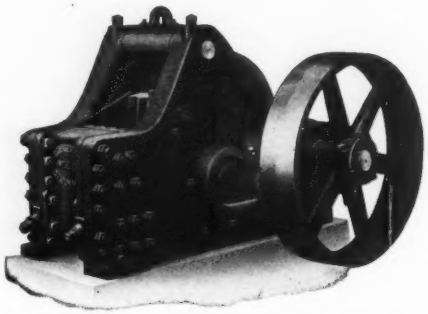

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For Coarse, Intermediate and Fine Crushing

A Size for Every Plant

Two jaw nips to each revolution of flywheels. One-half the shaft-speed of others to obtain equal outputs—slow speed—no hot boxes. Small double cam actuating a large roll is the simplest, most powerful and slowest moving action known, therefore durable. Cast steel construction combined with great leverages makes a machine of unusual power, durability and strength.

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CENTRIFUGAL AIR SEPARATOR

The first radical improvement in fine separation in a century

A principle which makes obsolete all other separating methods

60 mesh to 350 mesh

For limestone, coal, clay, silica, talc, graphite and all other dry ground materials

Increases B. P. L. content of Phosphate Rock

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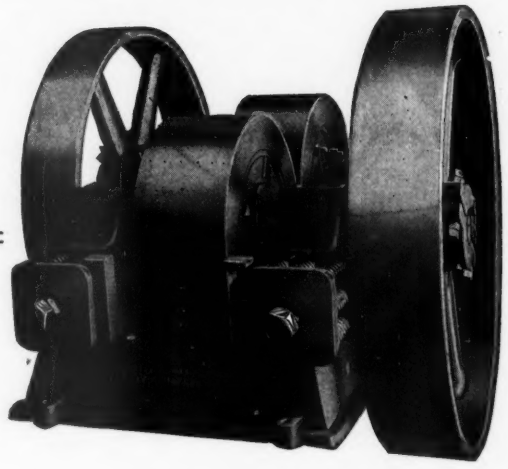

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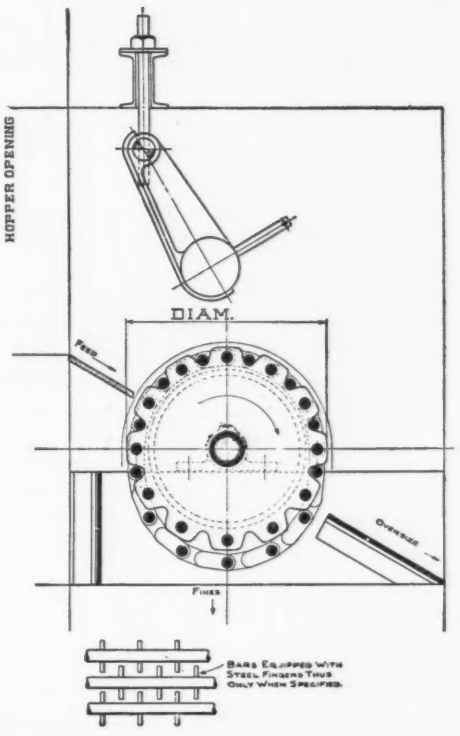
WEBB CITY, MISSOURI

Ross Automatic Drop Bar Grizzly Feeder and Screen

"For use in Mining, Smelting, Sand, Gravel, Crushed Stone, Coke, Coal, Blast Furnaces and numerous other plants."

"Cannot block or choke—will handle material at an even rate for 24 hours a day without labor or attendance."

"Replaces all types of Revolving Screens at a less cost per unit and less cost for horse power with greater tonnage and less repair cost."



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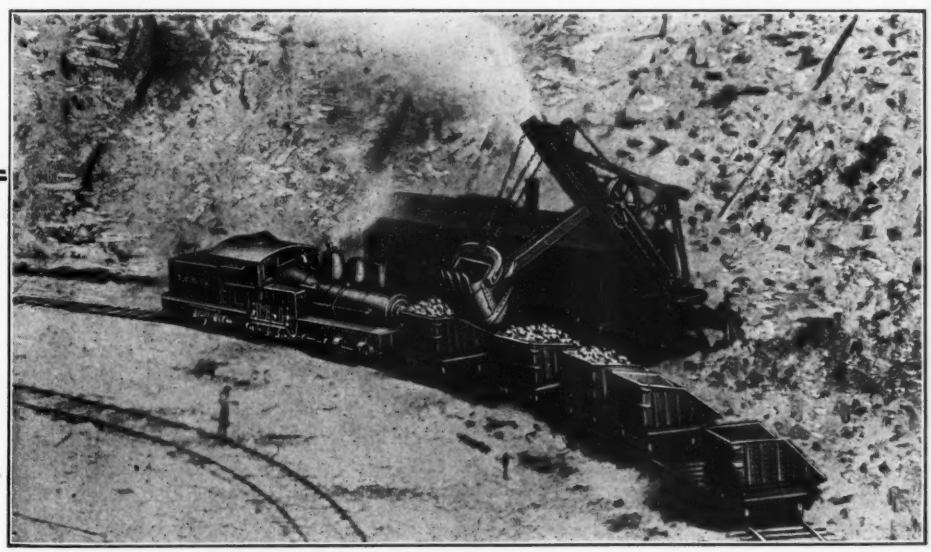

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In rock crusher service "Shay" locomotives are far ahead of rod engines.

They have fewer exposed wearing parts that dust and dirt will cut.

They are cheaper to maintain because you can easily replace any part without dismantling the engine.

"Shay" locomotives do more work per day than rod engines can do and cost less to operate and maintain.

We know, because we build both.

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1,152,606 Tons of Ore Handled

Total Screening Cost —

Less than one-tenth of a cent per ton!

One Mitchell Electric Vibrating Screen during 506 days of uninterrupted operation handled more than a million tons of ore at a cost of less than one tenth of a cent per ton, including power, labor and screen cloth expense.

The Mitchell shows a corresponding economy in handling coal, coke, sand, gravel, slag, limestone and fertilizers. And with each of these materials it has established new records equally striking for large tonnage and complete thoroughness of screening. Write us for full information as to the construction of the Mitchell and its effectiveness in YOUR particular industry.

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315 Felt Building, Salt Lake City **Grand Central Palace, New York**

See our exhibit at the Seventh National Exposition of Chemical Industries, Eighth Coast Artillery Armory, New York, Week of September 12th

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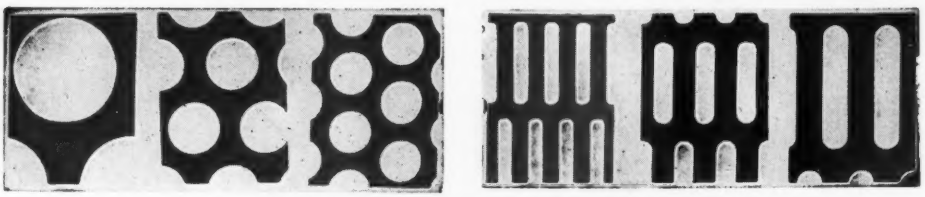

All sizes and shapes of holes

For Screening Stone, Gravel, Sand, Cement and all Minerals

FOR YOU—a warehouse filled with sheets and plates of Steel and other metals. Vaults crowded with costly dies for making innumerable sizes and shapes of holes in these sheets, for You.

Perforating is our specialty and our work is well done. Excellent facilities and efficient labor permit us to offer you the highest grade of workmanship at economical prices.

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GRAVEL Washed *and* Screened

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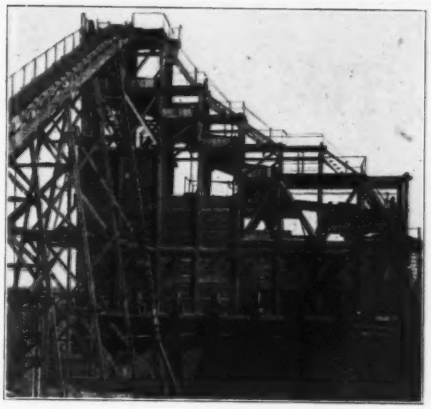

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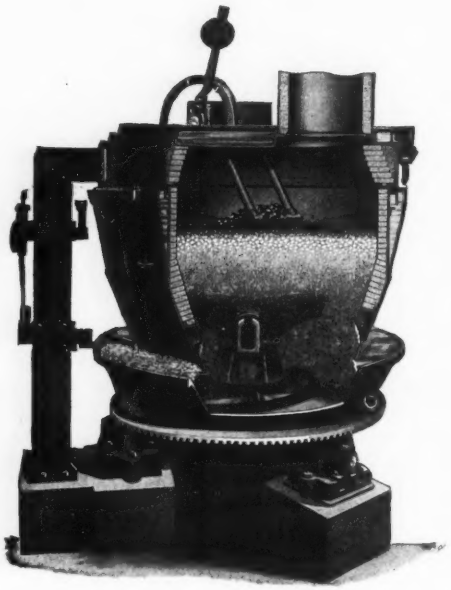

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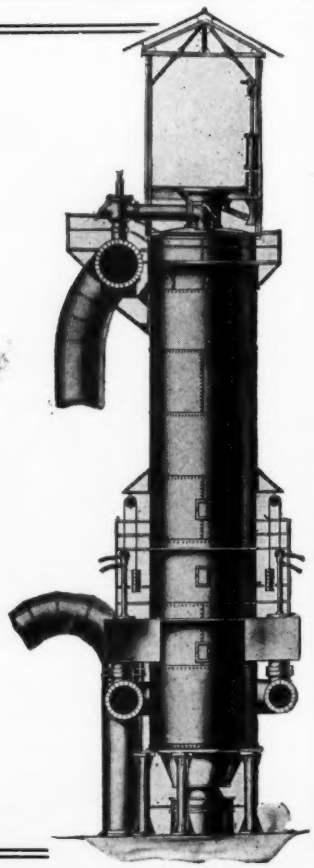

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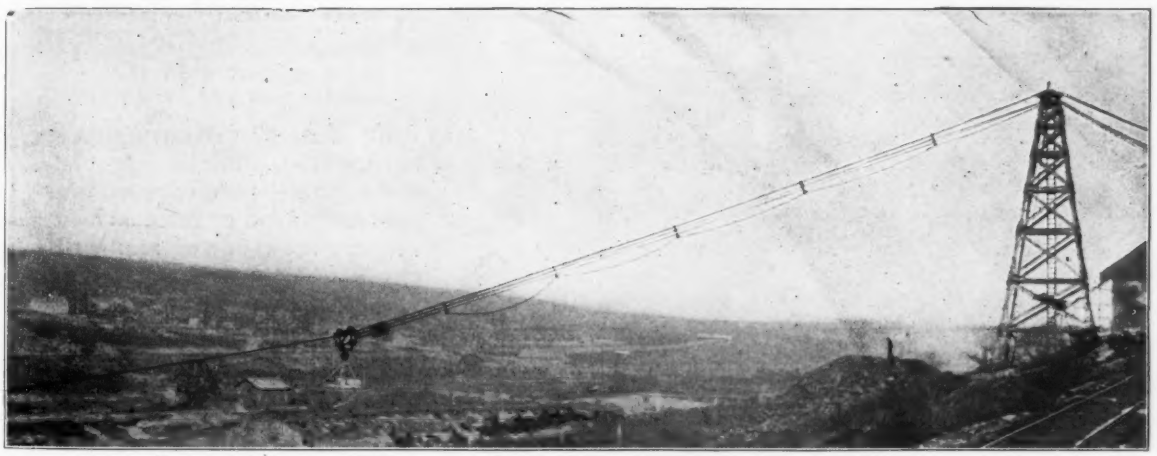

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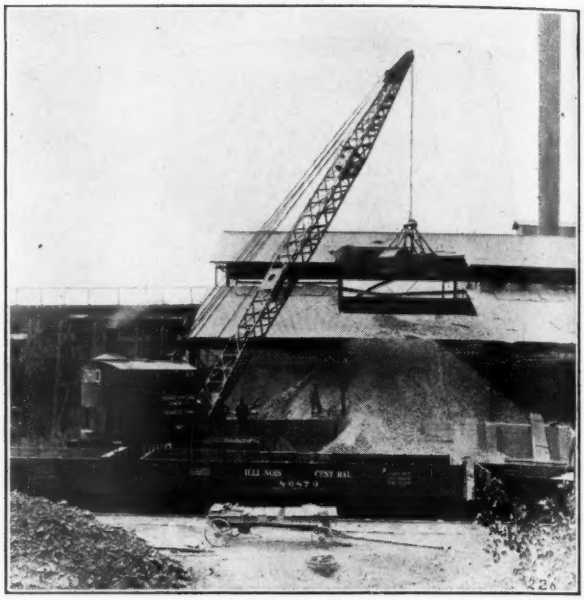

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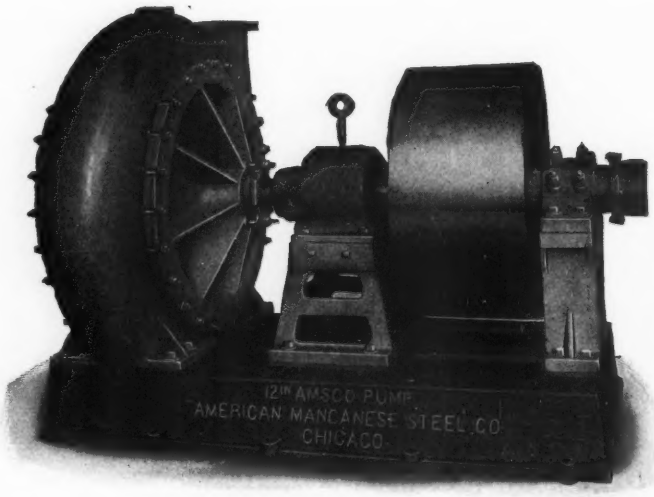

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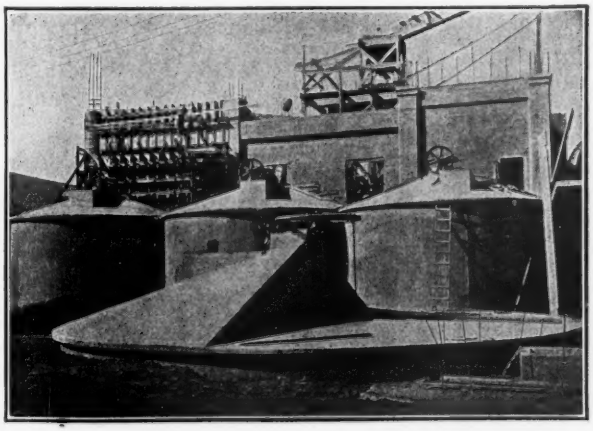

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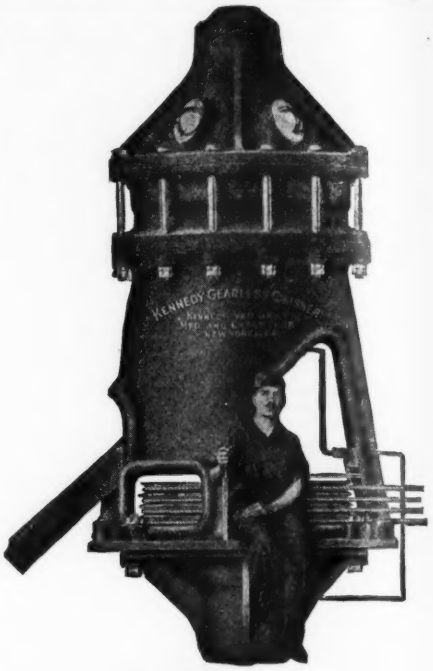

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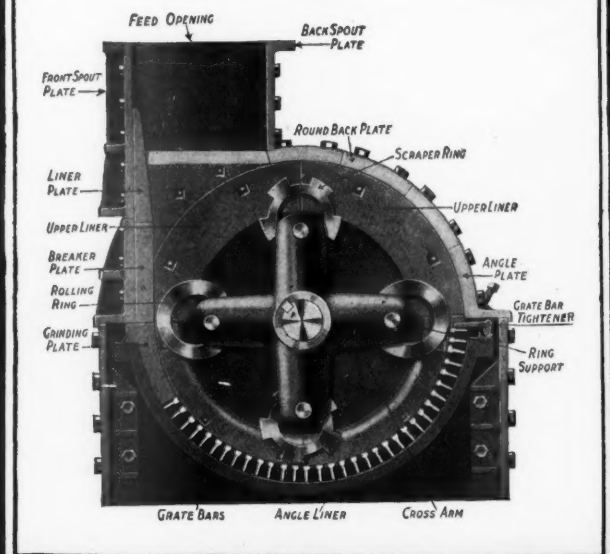

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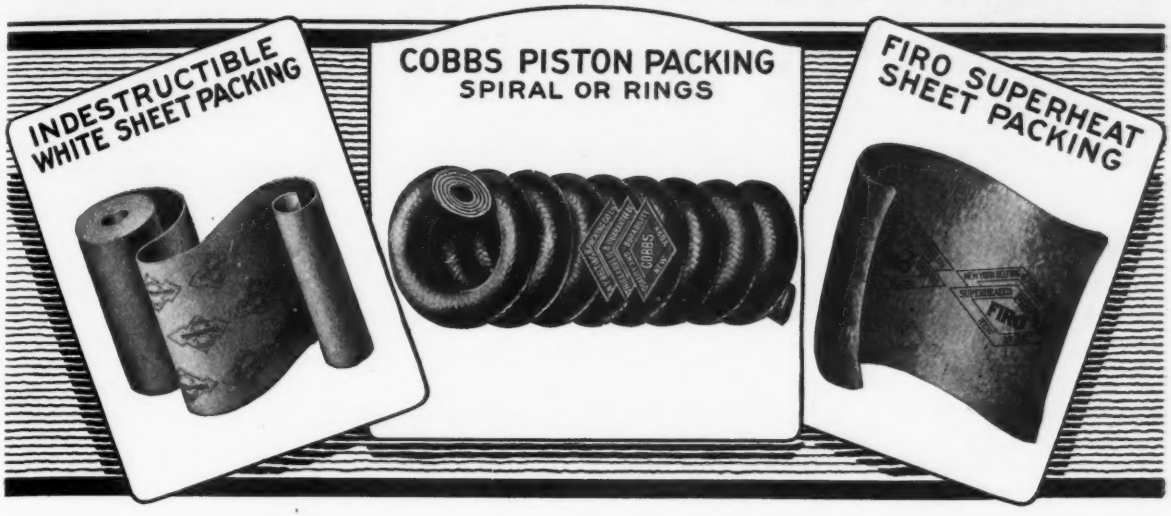

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